

**PROCEEDINGS**  
**OF THE**  
**SCIENTIFIC MEETINGS**  
**OF THE**  
**ZOOLOGICAL SOCIETY**  
**OF LONDON**  
**FOR THE YEAR**  
**1884.**

---

**PRINTED FOR THE SOCIETY,**  
**AND SOLD AT THEIR HOUSE IN HANOVER SQUARE.**  
**LONDON:**  
**MESSRS. LONGMANS, GREEN, READER, AND DYER,**  
**PATERNOSTER ROW.**

LIST  
OF THE  
COUNCIL AND OFFICERS  
OF THE  
ZOOLOGICAL SOCIETY OF LONDON.  
1884.

COUNCIL.

(*Elected April 29, 1884.*)

PROFESSOR W. H. FLOWER, LL.D., F.R.S., *President.*

MAJOR-GEN. THE LORD ABINGER, C.B.	ARTHUR GROTE, Esq., <i>Vice-President.</i>
MAJOR-GEN. HENRY CLERK, R.A., F.R.S.	PROFESSOR MIVART, F.R.S., <i>Vice-President.</i>
GEORGE E. DOBSON, Esq., M.A., F.R.S.	PROFESSOR ALFRED NEWTON, F.R.S., <i>Vice-President.</i>
HENRY E. DRESSER, Esq.	HENRY POLLOCK, Esq.
CHARLES DRUMMOND, Esq., <i>Treasurer.</i>	THOMAS H. POWELL, Esq.
SIR JOSEPH FAYRER, K.C.S.I., F.R.S., <i>Vice-President.</i>	OSBERT SALVIN, Esq., F.R.S., <i>Vice-President.</i>
JOHN P. GASSIOT, Esq.	W. AYSHFORD SANDFORD, Esq.
F. DUCANE GODMAN, Esq.	PHILIP LUTLEY SCLATER, Esq., M.A., Ph.D., F.R.S., <i>Secretary.</i>
LIEUT.-COL. H. H. GODWIN-AUSTEN, F.R.S.	JOSEPH TRAVERS SMITH, Esq.
COL. J. A. GRANT, C.B., F.R.S.	THE LORD WALSHINGHAM, <i>Vice-President.</i>



PINKETTS OFFICERS.

P. L. SCLATER, Esq., M.A., Ph.D., F.R.S., *Secretary.*  
FRANK E. BEDDARD, Esq., M.A., *Prosector.*  
MR. A. D. BARTLETT, *Superintendent of the Gardens.*  
MR. F. H. WATERHOUSE, *Librarian.*  
MR. JOHN BARROW, *Accountant.*  
MR. W. J. WILLIAMS, *Chief Clerk.*

# LIST

## OF THE

### CONTRIBUTORS,

*With References to the several Articles contributed by each.*

	Page
<b>BARTLETT, A. D.,</b> Superintendent of the Society's Gardens.	
On some Hybrid Bovine Animals bred in the Society's Gardens. (Plates XXXIV. & XXXV.) .....	399
<b>BATES, H. W.,</b> F.R.S., F.Z.S.	
List of Coleoptera of the Families Carabidæ and Scarabæidæ collected by the late W. A. Forbes on the Lower Niger ....	404
<b>BEDDARD, FRANK E.,</b> M.A., F.R.S.E., F.G.S., F.Z.S., Pro- sector to the Society.	
Preliminary Notice of the Isopoda collected during the Voyage of H.M.S. 'Challenger.'—Part I. <i>Serolis</i> .....	330
On some Points in the Structure of <i>Hapalemur griseus</i> ..	391
Notice of a Memoir on the Anatomy and Systematic Position of a gigantic Earthworm ( <i>Microchaeta rappi</i> ), from the Cape Colony .....	478
A Contribution to the Anatomy of <i>Scopus umbretta</i> ....	543
Note on the Presence of an Anterior Abdominal Vein in <i>Echidna</i> .....	553

**BELL, F. JEFFREY, M.A., Sec. R.M.S., F.Z.S.,** Professor of  
Comparative Anatomy in King's College, London.

On the Generic Position and Relations of *Echinanthus tumidus*, Woods. (Plates II. & III.) ..... 40

Contributions to the Systematic Arrangement of the  
Asteroidea.—II. The Species of *Oreaster* ..... 57

Exhibition of, and remarks upon, *Estheria melitensis*. ... 251

Studies in the Holothuroidea.—III. On *Amphicyclus*, a  
new Genus of Dendrochirotus Holothurians, and its bearing  
on the Classification of the Family ..... 253

Studies in the Holothuroidea.—IV. On the Structural  
Characters of the Cotton-spinner (*Holothuria nigra*), and  
especially of its Cuvierian Organs. .... 372

Studies in the Holothuroidea.—V. Further Notes on the  
Cotton-spinner ..... 563

**BERLEPSCH, HANS Graf von, C.M.Z.S., and TACZANOWSKI,  
L., C.M.Z.S.**

Deuxième liste des Oiseaux recueillis dans l'Ecuadeur  
occidental par MM. Stolzmann et Siemiradzki. (Plate  
XXIV.) ..... 281

**BIDDULPH, Lieut.-Col. J., F.Z.S.**

On the Wild Sheep of Cyprus. (Plate LVIII.) ..... 593

**BLANFORD, W. T., F.R.S., F.Z.S.**

Report on the Collection of Drawings of Himalayan Birds  
lately presented to the Society's Library by Mr. Brian H.  
Hodgson, F.Z.S. .... 56

Exhibition of, and remarks upon, a series of Heads of *Ovis poli*. .... 326

**BOULENGER, G. A., F.Z.S.**

Note upon a large Lizard of the Genus *Phelsuma*, from  
Rodriguez, sent by Mr. J. C. O'Halloran ..... 1

	Page
Diagnoses of new Reptiles and Batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M.B., H.M.S. 'Lark' ..	210
Notice of a Memoir on the Reptiles and Batrachians of the Solomon Islands .....	251
Description of a new Variety of <i>Lacerta viridis</i> , from South Portugal. (Plate XXXVIII.) .....	418
Notes on the Edible Frog in England. (Plate LV.) ....	573
 BRYDON, Major W., B.S.C., C.M.Z.S.	
Exhibition of an egg of Blyth's Tragopan ( <i>Cerionis blythi</i> ). 477	
Letter from, containing an account of his efforts to procure <i>Budorcas taxicolor</i> for the Society .....	477
 BUTLER, ARTHUR G., F.L.S., F.Z.S., &c.	
On a Collection of Lepidoptera made by Major J. W. Yerbury at or near Aden. (Plate XLVI.) .....	478
 BUTT, G. F., F.Z.S.	
Exhibition of two examples of a variety of the Red Grouse ( <i>Lagopus scoticus</i> ) shot in Westmoreland .....	45
 CAMBRIDGE, Rev. O. PICKARD, M.A., C.M.Z.S., Hon. Mem. New-Zealand Institute.	
On two new Genera of Spiders. (Plate XV.) .....	196
 CAMERANO, Dr. LAURENTIO.	
Amphibiorum Italise enumeratio systematica .....	421
 CLARK, JOHN W., F.Z.S.	
On a Sea-Lion from the East Coast of Australia ( <i>Otaria cinerea</i> , Péron) .....	188
 COLLETT, ROBERT, C.M.Z.S.	
On some apparently new Marsupials from Queensland. (Plates XXIX.-XXXII.) .....	381

## DAY, FRANCIS, F.L.S., F.Z.S.

On Races and Hybrids among the <i>Salmonidæ</i> .....	17
Exhibition of, and remarks upon, a specimen of a Dog-fish ( <i>Acanthias vulgaris</i> ) internally devoured by parasites ....	44
On Races and Hybrids among the <i>Salmonidæ</i> .—Part II.	376
On the Occurrence of <i>Lumpenus lampetriformis</i> off the East Coast of Scotland. (Plate XLI.) .....	445
On Races and Hybrids among the <i>Salmonidæ</i> .—Part III. (Plates LVI. & LVII.) .....	581

## DISTANT, W. L.

On the Rhynchota collected by the late W. A. Forbes on the Lower Niger .....	458
---	-----

## DOBSON, G. E., M.A., M.B., F.R.S., F.L.S., F.Z.S.

On the Myology and Visceral Anatomy of <i>Capromys melanurus</i> , with a Description of the Species. (Plates XVIII.—XXI.) .....	233
On the Unimportance of the Presence or Absence of the Hallux as a Generic Character in Mammalogy, as shown by the gradual Disappearance of this Digit within the limits of a single Genus .....	402
Exhibition of, and remarks upon, a diagram designed to illustrate the Evolution of the Mammalia according to Prof. Huxley .....	562

## DRESSER, HENRY E., F.Z.S.

Exhibition of, and remarks upon, specimens of <i>Sylvia nisoria</i> and <i>Hypolais icterina</i> , killed in Norfolk .....	477
--	-----

## DRUCE, HERBERT, F.L.S., F.Z.S.

On the Lepidoptera collected by the late W. A. Forbes on the Banks of the Lower Niger.—HETEROCERA. (Plate XVII.) .....	219
On a Collection of Heterocera from Dominica. (Plate XXV.) .....	321

## FAYRER, Sir JOSEPH, F.Z.S.

- Exhibition of some additional specimens of Deer's Antlers gnawed by other Deer ..... 2

## FLOWER, WILLIAM HENRY, LL.D., F.R.S., F.L.S., President of the Society.

- Remarks upon the Burmese Elephant deposited in the Society's Gardens ..... 44

Remarks on the Society's Removal to their New Premises . 205

- Exhibition of, and remarks upon, four skulls of the Common Bottle-nose Whale (*Hyperoodon rostratus*), showing the Development, with age, of the Maxillary Crests ..... 206

- Exhibition of a mass of pure Spermaceti obtained from the "Head-matter" of Hyperoodons ..... 206

- Note on the Dentition of a young Capybara (*Hydrochoerus capybara*) ..... 252

- Note on the names of two Genera of *Delphinidae* ..... 417

## FORBES, H. O., F.Z.S., F.R.G.S.

- Remarks on a Paper by Dr. A. B. Meyer on a Collection of Birds from the East-Indian Archipelago, with special reference to those described by him from the Timor-Laut group of Islands..... 425

## GARSON, J. G., M.D., F.Z.S.

- Exhibition of a specimen of *Lithodes maia*, the Northern Stone-Crab ..... 329

## GODMAN, FREDERICK DuCANE, F.L.S., F.Z.S., and SALVIN, OSBERT, M.A., F.R.S., F.Z.S.

- On the Lepidoptera collected by the late W. A. Forbes on the Banks of the Lower Niger.—RHOPALOCERA. (Plate XVII.) ..... 219

- A List of the Rhopalocera collected by Mr. G. French Angas in the Island of Dominica. (Plate XXV.) ..... 314

## GODWIN-AUSTEN, Lieut.-Col. H. H., F.R.S., F.Z.S., &amp;c.

- Exhibition of, and remarks upon, an old Indian drawing containing a figure of a White Elephant ..... 251

GRANT, W. R. OGILVIE.

- A Revision of the Fishes of the Genera *Sicydium* and *Lentipes*, with Descriptions of five new Species. (Plates XI., XII.) ..... 153

GURNEY, JOHN HENRY.

- On the Geographical Distribution of *Huhua nipalensis*, Hodgs.; with Remarks on this and on some allied Species. (Plate LII.) ..... 558

HARTING, JAMES EDMUND, F.L.S., F.Z.S.

- Exhibition of, and remarks upon, some antlers of the Roe-deer (*Capreolus capræa*) from Dorsetshire ..... 152

HARTLAUB, DR. G., F.M.Z.S.

- On a new Species of *Salpornis* from Eastern Equatorial Africa. (Plate XXXVII.) ..... 415

HOLMWOOD, FREDERIC, H.B.M. Consul Zanzibar.

- On the Employment of the Remora by Native Fishermen on the East Coast of Africa ..... 411

JEFFREYS, J. GWYN, LL.D., F.R.S., F.Z.S.

- On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. Part VII. (Plates IX., X.) ..... 111

- On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. Part VIII. (Plates XXVI.-XXVIII.)..... 341

LANKESTER, Prof. E. RAY, M.A., F.R.S., Jodrell Professor of Zoology in University College, London.

- Exhibition of a living example of a Scorpion from Ceylon. 207

LATASTE, FERNAND, C.M.Z.S.

- Description d'une espèce nouvelle de Gerbilline d'Arabie (*Meriones longifrons*). (Plates VI., VII.)..... 88

LECHE, W., of the University of Stockholm.

- On some Species of Chiroptera from Australia ..... 49

LE SOUEF, ALBERT, A. C., C.M.Z.S.

Letter from, containing remarks upon the Hatching of two  
Cygnets from one Egg of a Black-necked Swan ..... 390

LUMHOLTZ, CARL, M.A., of the University of Christiania.

Notes upon some Mammals recently discovered in Queens-  
land ..... 406

LÜTKEN, Dr. CH. W., F.M.Z.S.

Letter from, containing remarks as to the possibility of  
there being more than one Species of the Genus *Tachyglossus*  
inhabiting Australia ..... 150

MIERS, E. J., F.L.S., F.Z.S., Assistant in the Zoological  
Department, British (Natural History) Museum.

On some Crustaceans from Mauritius. (Plate I.) ..... 10

MIVART, ST. GEORGE, Ph.D., F.R.S., V.P.Z.S., M.R.I., &c.

On the Development of the Individual and of the Species  
as Forms of Instinctive Action ..... 462

NORMAN, Rev. A. M., and STEBBING, Rev. T. R. R.

Notice of the first part of a Memoir on the Crustacea  
Isopoda of the 'Porcupine,' 'Lightning,' and 'Valorous'  
Expeditions ..... 562

O'HALLORAN, J. C.

Exhibition of a rare Lizard from Rodriguez ..... 1

OWEN, Sir RICHARD, K.C.B., D.C.L., F.R.S., F.L.S., F.Z.S., &c.

Notice of the twenty-fifth of his series of Memoirs on  
Extinct Birds of the Genus *Dinornis* ..... 176

PARKER, T. JEFFREY.

Abstract of a Memoir on *Regalecus argenteus* ..... 207

PARR, J. C., F.Z.S.

Exhibition of, and remarks upon, a chick of the Vulturine  
Guinea-Fowl hatched in Lancashire ..... 477

POTTS, THOMAS H., of Ohinitaki, New Zealand.

- On a Case of Cross-breeding between two Species of Fly-catchers of the Genus *Rhipidura* ..... 530

POWERSCOURT, MERVYN, Viscount, F.Z.S., &c.

- On the Acclimatization of the Japanese Deer at Powerscourt ..... 207

PRYER, H., C.M.Z.S., &c.

- An Account of a Visit to the Birds'-nest Caves of British North Borneo ..... 532

RAMSAY, E. P., F.R.S.E., C.M.Z.S., F.L.S., &c.

- Description of a supposed new Species of Flycatcher, of the genus *Rhipidura*, from New Guinea ..... 580

RIEDEL, J. G. F., C.M.Z.S.

- Extracts of a letter from, containing remarks upon Mr. H. O. Forbes's paper on the Birds of Timorlao ..... 530

SALVADORI, THOMAS, M.D., C.M.Z.S.

- Note on *Anas capensis*, Gm. (Plate XIII.) ..... 172  
Notes on some Birds from Timor-Laut ..... 577

SALVIN, OSBERT, M.A., F.R.S., and GODMAN, F. DUCANE, F.L.S., F.Z.S.

- On the Lepidoptera collected by the late W. A. Forbes on the Banks of the Lower Niger. RHOPALOCERA. (Plate XVII.) ..... 219

- A List of the Rhopalocera collected by Mr. G. French Angas in the Island of Dominica. (Plate XXV.) ..... 314

SAUNDERS, HOWARD, F.L.S., F.Z.S.

- Exhibition of, and remarks upon, two rare Gulls and a Dusky Shearwater ..... 150

SCLATER, PHILIP LUTLEY, M.A., Ph.D., F.R.S., Secretary to  
the Society.

Report on the additions to the Society's Menagerie in December 1883.....	1
Exhibition of a Night Heron ( <i>Nycticorax griseus</i> ) shot in Plumstead Marshes.....	2
On the Lesser Koodoo, <i>Strepsiceros imberbis</i> , of Blyth. (Plate IV.).....	45
Report on the additions to the Society's Menagerie in January 1884.....	55
Remarks upon a copy of the lately issued 'Guide to the Calcutta Zoological Gardens' and on <i>Rhinoceros lasiotis</i> ..	55
Report on the additions to the Society's Menagerie in February 1884. (Plate XIV.) .....	176
Exhibition of, and remarks upon, specimens of the Eggs of two Species of Testudinata laid in the Society's Gardens..	206
Report on the additions to the Society's Menagerie in April 1884.....	251
Report on the additions to the Society's Menagerie in May 1884. (Plate XXXIII.).....	389
Exhibition of, and remarks upon, the deciduous knob of the Culmen of the Beak of the Rough-billed Pelican ( <i>Pele- canus trachyrhynchus</i> ) .....	410
Remarks upon a very singular Habit of the Greater Vasa Parrot ( <i>Coracopsis vasa</i> ) .....	410
Report on the additions to the Society's Menagerie in June, July, August, and September 1884. (Plate XLV. figs. 2, 3.) .....	475
Exhibition of, and remarks upon, a skin of a Woolly Cheetah ( <i>Felis lanea</i> ) from South Africa.....	476
Report on the additions to the Society's Menagerie in October 1884. (Plate XLV. fig. 1.) .....	530

	Page
On some Mammals from Somali-land. (Plates XLIX. & L.) .....	538
Report on the additions to the Society's Menagerie in November 1884 .....	561
Remarks upon the death of a Greater Vasa Parrot ( <i>Crocops vasa</i> ) which had passed 54 years in the Society's Menagerie .....	562
 SEEBOHM, HENRY, F.Z.S.	
Exhibition of, and remarks upon, a Skin of an American Kestrel ( <i>Falco sparverius</i> ) shot in the neighbourhood of Helmsley, Yorkshire .....	45
Exhibition of, and remarks upon, some Skins of rare European and Asiatic Birds .....	409
 SHARPE, R. BOWDLER, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.	
Description of a new Species of <i>Laniarius</i> from Ashantee. (Plate V.) .....	54
Exhibition of specimens of the Red-throated Pipit ( <i>Anthus cervinus</i> ) caught near Brighton, and of the true Water-Pipit ( <i>Anthus spinoletta</i> ) captured at Lancing, in Sussex .....	206
Descriptions of three rare Species of Flycatchers. ....	230
On an apparently new Species of European Nuthatch. ....	233
Exhibition of, and remarks upon, a new European Nuthatch ( <i>Sitta whiteheadi</i> ) .....	329
Further Notes on Whitehead's Nuthatch. (Plate XXXVI.)	414
 SHELLEY, Captain G. E., F.Z.S.	
On five new or little-known Species of East-African Birds, represented in Mr. H. H. Johnston's First Collection from the Kilimanjaro District. (Plate LI.) .....	554
 SLATER, Rev. H. H., F.Z.S.	
Exhibition of, and remarks upon, a specimen of Barred Warbler ( <i>Sylvia nisoria</i> ) obtained on the Yorkshire coast ..	477

## SMITH, EDGAR A., F.Z.S.

- An Account of the Land and Freshwater Mollusca collected during the Voyage of the 'Challenger' from December 1872 to May 1876. (Plates XXII., XXIII.) . . . . . 258

## SUTTON, J. BLAND, F.R.C.S., Lecturer on Comparative Anatomy, Middlesex Hospital Medical College.

- On the Diseases of the Carnivorous Mammals in the Society's Gardens . . . . . 177
- Observations on the Parasphenoid, the Vomer, and the Palato-pterygoid Arcade. (Plates LIIL, LIV.) . . . . . 566

## SWINHOE, Lt.-Col. C., F.Z.S.

- On some new and little-known Species of Butterflies of the Genus *Teracolus*. (Plates XXXIX., XL.) . . . . . 434
- On Lepidoptera collected at Kurrachee. (Plates XLVII., XLVIII.) . . . . . 503

## TACZANOWSKI, L., C.M.Z.S., and BERLEPSCH, Hans Graf von, C.M.Z.S.

- Deuxième liste des Oiseaux recueillis dans l'Ecuadeur occidental, par MM. Stolzmann et Siemiradski. (Plate XXIV.) . . . . . 281

## TEGETMEIER, WILLIAM BERNHARD, F.Z.S.

- Exhibition of specimens of the Pink-footed Goose, showing variation of colouring in the feet . . . . . 176
- Exhibition of an example of the File-fish (*Balistes caprisus*) caught off Folkestone . . . . . 478

## THOMAS, OLDFIELD, F.Z.S.

- On a Collection of *Muridæ* from Central Peru. (Plates XLII.-XLIV.) . . . . . 447

## TRISTRAM, Rev. Canon H.B., M.A. (Oxon.), F.R.S., C.M.Z.S.

- Exhibition of, and remarks upon, some specimens of the genus *Pachycephala* . . . . . 2

WELDON, W. F. R., B.A., Scholar of St. John's College, Cambridge, Assistant Demonstrator in the Morphological Laboratory of the University.	
Note on the Placentation of <i>Tetraceros quadricornis</i> . . . .	2
Notes on <i>Callithrix gigot</i> . . . . .	6
WOOD-MASON, JAMES, F.Z.S., Deputy Superintendent, Indian Museum, Calcutta.	
Description of an Asiatic Species of the Neuropterous genus <i>Corydalis</i> . (Plate VIII.) . . . . .	110
WATERHOUSE, CHARLES O.	
On the Coleopterous Insects collected by Mr. H. O. Forbes in the Timor-Laut Islands. (Plate XVI.) . . . . .	213

---

#### ERRATA.

- P. 110, 9th line from top, for "ocelli" read "spines."  
 P. 576, 3rd line from bottom, for Fig. 1 read Figs. 1, 2.  
 P. 576, bottom line, for Fig. 2 read Fig. 3.  
 P. 577, 3rd line from top, for R. SALVADORI read T. SALVADORI.

# LIST OF PLATES.

1884.

Plate		Page
I.	Fig. 1. <i>Callianassa martensi</i> . Fig. 2. <i>C. mauritiana</i> . Fig. 3. <i>Gonodactylus trachurus</i> .....	10
II.	<i>Anomalanthus tumidus</i> .....	40
III.	<i>Strepsiceros imberbis</i> .....	45
IV.	<i>Laniarius lagdeni</i> .....	54
V.	<i>Meriones longifrons</i> .....	88
VI.	<i>Meriones shawi</i> , ♀ .....	
VII.	<i>Corydalis asiatica</i> .....	110
VIII.	Mollusca of the 'Lightning' and 'Porcupine' Expedi- tions .....	111
IX.	New Species of <i>Sicydium</i> and <i>Lentipes</i> .....	153
X.	<i>Anas capensis</i> .....	172
XI.	<i>Cercopithecus martini</i> .....	176
XII.	New Spiders .....	196
XIII.	Coleoptera from Timor-Laut .....	213
XIV.	West African Lepidoptera .....	219
XV.	<i>Capromys melanurus</i> .....	233
XVI.	Anatomy of <i>Capromys</i> .....	233
XVII.	New terrestrial and fluviatile Mollusca from the 'Chal- lenger' Expedition .....	258
XVIII.	Fig. 1. <i>Chlorospingus ochraceus</i> . Fig. 2. <i>Spermophila</i> <i>pauper</i> .....	281
XIX.	Lepidoptera from Dominica .....	314
XX.	Mollusca of the 'Lightning' and 'Porcupine' Expe- ditions .....	341
XXI.	<i>Phalangista archeri</i> .....	381
XXII.	<i>Phalangista herbertensis</i> .....	
XXIII.	<i>Phalangista lemuroides</i> .....	
XXIV.	<i>Dendrolagus lumholtzi</i> .....	
XXV.	<i>Sphingurus spinosus</i> .....	389

Plate		Page
XXXIV.	Hybrid Bovines .....	399
XXXV.	Hybrid Bovine.....	
XXXVI.	<i>Sitta whiteheadi</i> , ♂ et ♀.....	414
XXXVII.	<i>Salpornis emini</i> .....	415
XXXVIII.	<i>Lacerta viridis</i> , var. <i>gadovii</i> .....	418
XXXIX.	Species of <i>Teracolus</i> .....	434
XL.		
XLI.	<i>Lumpenus lampetiformis</i> .....	445
XLII.	Fig. 1. <i>Hesperomys laticeps</i> , var. <i>nitidus</i> . Fig. 2. <i>H. bimaculatus</i> , var. <i>lepidus</i> .....	447
XLIII.	Fig. 1. <i>Hesperomys scalops</i> . Fig. 2. <i>Rheithrodon</i> <i>pictus</i> .....	
XLIV.	Skulls and other characters of Peruvian Muridæ ....	475
XLV.	Fig. 1. <i>Colius nigricollis</i> . Figs. 2, 3. <i>Colius erythromelon</i> .....	
XLVI.	Geographical Distribution of the Aden forms of <i>Limnas</i> .	478
XLVII.	New Lepidoptera from Kurrachee .....	503
XLVIII.		
XLIX.	<i>Gazella walleri</i> .....	538
L.	Fig. 1. Wild Ass of Somali-Land. Fig. 2. Wild Ass of Nubia .....	
LI.	<i>Nectarinia reichenowi</i> .....	554
LII.	<i>Huhua nipalensis</i> .....	558
LIII.	The Parasphenoid of a Fish, and the Vomer of Man..	566
LIV.	The hard Palate of a Lizard, Wombat, and Man ....	
LV.	Figs. 1, 2. <i>Rana esculenta</i> , var. <i>lessoneæ</i> . Fig. 3. <i>Rana esculenta</i> , var. <i>typica</i> .....	573
LVI.	Male hybrid between <i>Salmo levenensis</i> , ♀, and <i>S. fontinalis</i> , ♂ .....	581
LVII.	Male hybrid between <i>Salmo fontinalis</i> , ♀, and <i>S. alpinus</i> , ♂ .....	
LVIII.	<i>Ovis ophion</i> .....	593

# LIST OF WOODCUTS.

1884.

	Page
Gravid uterus of <i>Tetraceros quadricornis</i> .....	3
Diffuse ridges of the placenta of <i>Tetraceros quadricornis</i> .....	4
One extremity of chorion of <i>Tetraceros quadricornis</i> .....	5
Maternal cotyledon of <i>Tetraceros</i> .....	5
Liver of <i>Callithrix gigot</i> .....	7
Cæcum of <i>Callithrix gigot</i> .....	8
Cæcum of <i>Callithrix moloch</i> .....	8
Larynx of <i>Callithrix gigot</i> .....	9
Brain of <i>Callithrix gigot</i> .....	9
Head and horns of <i>Strepsiceros kudu</i> .....	47
Head and horns of <i>Strepsiceros imberbis</i> .....	47
Skull of <i>Nyctinomus petersi</i> .....	49
Skull of <i>Nyctinomus brasiliensis</i> .....	49
Head and skull of <i>Nyctinomus albidus</i> .....	50
Head of <i>Taphozous affinis</i> , var. <i>insignis</i> .....	52
Crâne de <i>Meriones shawi</i> .....	94
Crâne de <i>Meriones erythrurus</i> .....	96
Crâne de <i>Meriones longifrons</i> .....	96
The left half of the thorax of <i>Arctictis binturong</i> .....	179
A longitudinal section through the last dorsal and first lumbar vertebræ of a Lion affected with "late rickets" .....	180
Ovary and Fallopian tube of an old Tiger .....	184
Uterus of a Jackal .....	186
<i>Otaria cinerea</i> , ♂; side view of skull .....	189
<i>Otaria cinerea</i> , ♂; under surface of hinder half of skull .....	190
<i>Otaria cinerea</i> , ♀; side view of skull .....	191
<i>Otaria cinerea</i> , ♀; under surface of skull .....	192
<i>Otaria cinerea</i> , ♀; upper surface of anterior half of skull .....	193
Palates of <i>Otaria cinerea</i> .....	195
Japanese Deer ( <i>Cervus sika</i> ) .....	209
Pectoral and cervical muscles of <i>Capromys melanurus</i> .....	236
Intersecting slips of the right and left <i>recti abdominis</i> and <i>obliqui externi</i> muscles near their attachments to the pubic bones in <i>Capromys melanurus</i> .....	238
Muscles on the anterior aspect of the thigh and leg in <i>Capromys melanurus</i> .....	243
Origins and connexions of the nerves of the brachial plexus and lumbar plexus in <i>Capromys melanurus</i> .....	249

	Page
Heads of varieties of <i>Ovis poli</i> .....	328
Figure of lower portion of the body of <i>Holothuria nigra</i> .....	374
<i>Salmo leuvenensis</i> , 29 and 43 days old; <i>S. fontinalis</i> ♂, <i>S. leuvenensis</i> ♀, 27 days old; <i>S. salar</i> ♂, <i>S. leuvenensis</i> ♀, 27, 41, and 91 days old .....	377
<i>Phalangista archeri</i> , ♀; skull seen from above .....	382
<i>Phalangista archeri</i> , ♂; side view of skull .....	383
<i>Phalangista herbertensis</i> , ♀; skull seen from above .....	384
<i>Phalangista herbertensis</i> , ♀; side view of skull .....	385
<i>Phalangista lemuroides</i> , ♀; skull seen from above .....	386
<i>Phalangista lemuroides</i> , ♀; side view of skull .....	387
<i>Dendrolagus humholtzi</i> , skull seen from above, and side view .....	388
Cygnets of <i>Cygnus nigricollis</i> .....	390
Hand of <i>Hapalemur griseus</i> .....	393
Liver of <i>Hapalemur griseus</i> .....	396
<i>Anomala forbesi</i> .....	404
<i>Temnorhynchus cribratus</i> and <i>Gnathocera sericimitens</i> .....	405
Tail-end of Remora, with wrought-iron band and ring; ditto, with ring fixed on by wire .....	412
Syrinx of <i>Scopus umbretta</i> .....	544
Muscles and tendon of patagium of <i>Scopus umbretta</i> .....	546
Muscles of leg of <i>Scopus umbretta</i> .....	550
Deep plantar tendons of <i>Scopus umbretta</i> .....	551
Three views of the human superior maxilla .....	569
Diagrammatic view of the Eustachian cartilage and related nerves ..	571
Chondro-cranium of a human foetus at the third month .....	572
Heads of male and female Otago Trout .....	590
Head of Lochleven Trout .....	591
<i>Ovis ophion</i> , front view of horns .....	594
<i>Ovis ophion</i> , side view of head with horns .....	594

PROCEEDINGS  
OF THE  
SCIENTIFIC MEETINGS  
OF THE  
ZOOLOGICAL SOCIETY OF LONDON.

---

January 15, 1884.

Prof. Newton, F.R.S., F.Z.S., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1883:—

The total number of registered additions to the Society's Menagerie during the month of December was 81, of which 58 were by presentation, 10 by purchase, and 13 were received on deposit. The total number of departures during the same period, by death and removals, was 114.

---

The Secretary read a communication from Mr. J. C. O'Halloran, Chief Commissioner and Police Magistrate for Rodriguez, stating that he had sent for the Society a specimen of a large Lizard said to be found only in that Island and to be very rare there. The following note upon the specimen in question from Mr. G. A. Boulenger, F.Z.S., was also read:—

"The specimen you kindly send to me belongs to an undescribed species of the genus *Phelsuma*, a small group of diurnal Geckos confined to Madagascar, the Seychelles, Comoro, Mascarene, and Andaman Islands, and of which I distinguish 7 or 8 species. The Rodriguez form was previously known to me from a single specimen, about the size of the one you now submit to me, presented by Mr. E.

Newton, which I have described and named *Phelsuma newtoni* in my still unpublished Catalogue of Lizards.

"It is distinguished from the other species by several important characters. Comparing it with the typical species of the genus, *P. cepedianum*, from Mauritius and Bourbon, we see that it differs in the much larger size—the largest *P. cepedianum* measuring hardly 60 millim. without the tail, whilst *P. newtoni* measures 105 millim.—the stouter habit, the shorter snout, the very small nearly indistinct chin-shields, the much larger gular granules, the coloration, &c. According to Leguat (as quoted by Dr. Günther in his paper on the Extinct Reptiles of Rodriguez) two kinds of Lizards lived in Rodriguez in the beginning of the last century—one diurnal, the other nocturnal. The former is no doubt a *Phelsuma*, as suggested by Dr. Günther; and as it is said by Leguat to be a French foot long, there is, it seems to me, little doubt that the two specimens hitherto secured are the survivors of that probably nearly extinct species."

Mr. Selater exhibited, on the part of Mr. Henry Whitely, an immature specimen of the Night Heron (*Nycticorax griseus*), which had been shot in Plumstead marshes, Kent, on the 3rd December, 1883.

Sir Joseph Fayrer exhibited some additional specimens of the horns of Deer gnawed by other Deer, in confirmation of previous remarks on the subject.

Canon Tristram, F.R.S., exhibited and made remarks upon some specimens of species of the genus *Pachycephala* which appeared to him to have been ignored or wrongly united to other species in a recently published volume of the Catalogue of Birds of the British Museum.

The following papers were read:—

1. Note on the Placentation of *Tetraceros quadricornis*. By W. F. R. WELDON, B.A., Scholar of St. John's College, Cambridge, Assistant Demonstrator in the Morphological Laboratory of the University.

[Received December 12, 1883.]

In the course of last summer a gravid female specimen of the Four-horned Antelope which died at the Society's Gardens came into my hands for dissection. I take this opportunity of recording a few notes on the structure of the uterus and placenta.

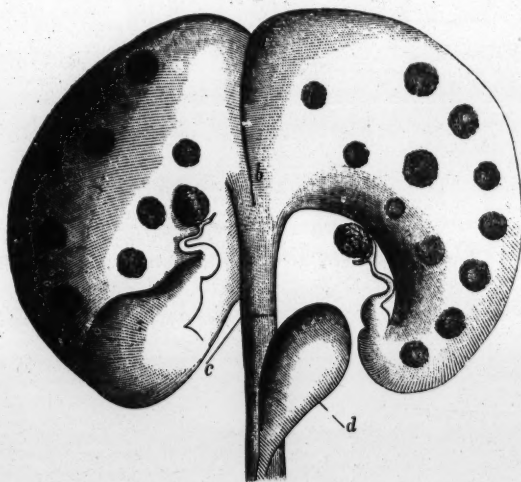
The external organs of generation were destroyed by rats before the animal was brought to me, so that I was unable to examine them. The upper part of the vagina was lined by flat, stratified epithelium,

devoid of carunculæ myritiformes, and thrown, in the collapsed state, into numerous irregular longitudinal folds.

The os uteri was guarded by a number of papillæ, and led not directly into the uterus, but into a passage, two inches and a half in length, which was plentifully beset with caruncles, and which at its upper end opened into the body of the uterus.

The uterus itself was divided into two compartments by a median antero-posterior septum, the free edge of which projected downwards for nearly an inch into the above-mentioned passage.

Fig. 1.



Gravid uterus of *Tetraceros quadricornis*; one half natural size.

a, b, line of constriction, indicating the dividing septum; c, level of os uteri; d, bladder.

The most noticeable thing about the shape of the uterus was the small size of the Fallopian tubes. In the accompanying drawing of the whole structure, one half the size of nature (fig. 1), the median constriction is an indication of the dividing septum. The placental cotyledons are seen through the walls as dark blots on the surface of the uterus.

On examining the placenta, the first point which struck me was the small number of cotyledons, one foetus having thirty and the other only twenty-two, whereas the smallest number hitherto recorded in any Antelope is sixty. The cotyledons were distributed irregularly over the surface of the chorion, the villi being simple and very large, each about 2mm. long. Each foetal cotyledon was surrounded by a raised ring, bearing small, densely packed villi (fig. 3), while the maternal cotyledons projected from the wall of

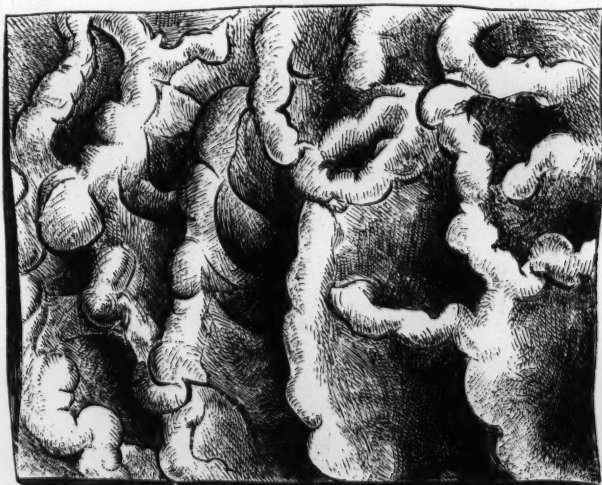
the uterus, each being borne on a constricted neck, much as in the Sheep (fig. 4). The average diameter of each cotyledon was 25 mm., though some were larger and some smaller.

There were also (fig. 2) occasional patches, each of some six or eight large villi, in various parts of the chorion.

The allantoic diverticulum was well developed (fig. 3, *al*).

The point of interest, however, about this placenta, is the existence over the whole surface of the chorion of vascular ridges, fitting into corresponding depressions of the uterine epithelium, and exactly

Fig. 2.



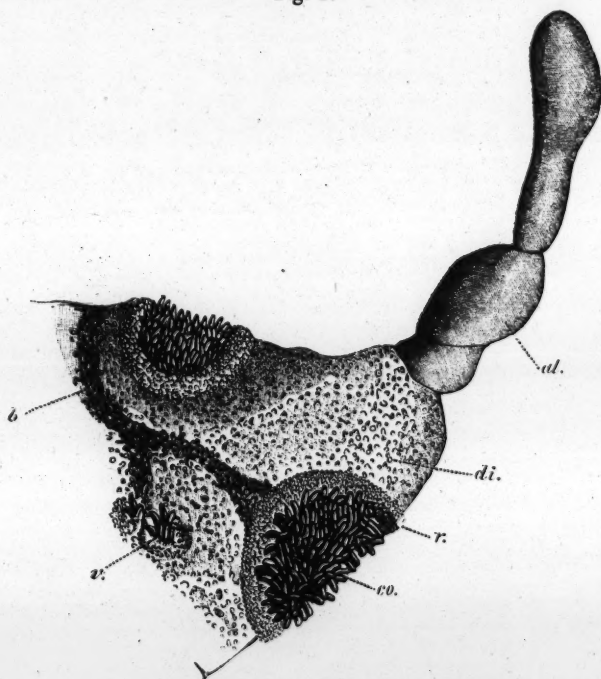
Diffuse ridges of the placenta of *Tetraceros quadricornis*.

resembling those ridges which form in the Pig the whole placental apparatus.

The velvety appearance, due to these folds, is more or less successfully represented in fig. 3; while a view of the chorion under a low magnifying-power is shown in fig. 4, where it is seen that the vascular ridges form an irregular network, into the meshes of which, between the ridges, open the numerous uterine glands (fig. 4, *u.gl.*).

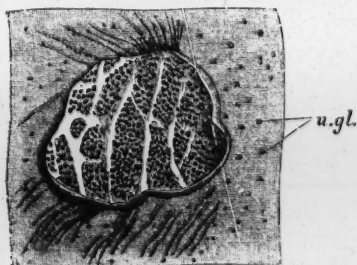
It will be seen, from what has been said, that this placenta is exactly intermediate in structure between the completely diffuse placenta of *Moschus* on the one hand, and the complex cotyledonary apparatus, of the Sheep for example, on the other. *Tetraceros* therefore stands, as far as its placenta is concerned, in the same place in the Antelope series as that occupied by *Cervus mexicanus* in the Cervine series.

Fig. 3.



One extremity of chorion of *Tetraceros quadricornis*.  
*al.*, allantoic diverticulum; *co.*, cotyledon; *v.*, its raised rim; *di.*, diffuse vascular ridges; *b.*, crown of blood-vessel, shown by greater prominence of ridges; *v.*, small patch of cotyledonary villi.

Fig. 4.



Maternal cotyledon of *Tetraceros*.  
*u. gl.*, mouths of uterine glands.

I may remark in conclusion another interesting embryonic feature of *Tetraceros*, namely the fact that it is, so far as I know, the only ruminant except *Moschus* with a uniserial psalterium<sup>1</sup>.

## 2. Notes on *Callithrix gigot*. By W. F. R. WELDON, B.A.

[Received December 12, 1883.]

In September last a specimen of the rare Monkey *Callithrix gigot*, Spix, died in the Society's Gardens, and came into my hands for dissection. It seems to me that a few short notes on its anatomy may be of use.

*External characters.*—The hair was long and soft, slightly woolly over the trunk. On the forehead it was shorter and more thickly set; over the limbs short and loose. The general colour of the dorsal surface was reddish grey, redder behind, more ashy over the forehead and limbs. A typical hair from the back was about two inches long; black at the root for half an inch, then cream-coloured for three quarters of an inch, the tip being ringed with chestnut and black.

The muzzle and chin were black, with a few short, strong, white hairs; a black line ran up the nose and round the eyes, the lids of which were white with black lashes. The long hairs of the brows were black. The forehead was thickly covered with pale grey hairs, slightly tipped with black; and a faint black ridge ran across it between the ears.

The ears themselves were black, covered with short black hairs except for a small grey tuft at the postero-external angle.

In front of the ears a very light grey band passed over the cheek, being continued above on to the forehead, below on to the chest.

The throat was naked, the skin in this region being of a bright pink colour.

The limbs had their inner surfaces pale grey, while the hands and feet are black.

The tail was red, the hair being more bushy at the base than at the apex, which might, however, be an effect of friction during confinement.

The dimensions of the specimen, which was a young female, are given below:—

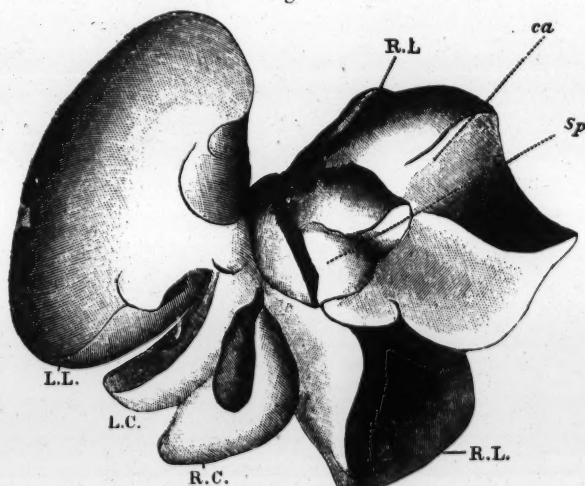
	foot.	inches.
From muzzle to root of tail, over back . . .	1	2
From chin to anus, over belly . . . . .	1	1
Length of tail, including hair . . . . .	1	1½
From occiput over forehead to upper lip . .	0	3½
Breadth of nasal septum . . . . .	0	7⁄8
From nostril to inner canthus . . . . .	0	¾

<sup>1</sup> See Professor Garrod's valuable remarks on the arrangement of this structure, P. Z. S. 1877.

	foot.	inches.
From outer canthus to base of ear .....	0	1
Extreme length of hand (palmar).....	0	2 $\frac{3}{4}$
"    "    fore arm .....	0	3
"    "    upper arm .....	0	2 $\frac{7}{8}$
"    "    foot (plantar) .....	0	3 $\frac{7}{8}$
"    "    crus .....	0	4
"    "    thigh .....	0	4 $\frac{3}{4}$

The tongue, mouth, and salivary glands present few points of interest; the stomach is simple, though its transverse diameter is longer proportionally than in man. The biliary and pancreatic ducts

Fig. 1.

Liver of *Callithrix gigot*, nat. size.

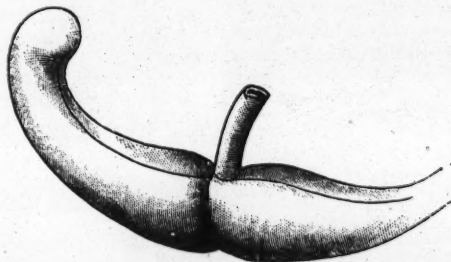
R.C., L.C., right and left central; R.L., L.L., right and left lateral; *Sp.*, spigelian; *ca.*, caudate lobes.

open together an inch below the pylorus. The liver (fig. 1) is much more deeply divided than in *Callithrix moloch*. The right lateral lobe is also very much larger, and partially divided into two, while the caudate lobe is smaller than in the allied species. The small intestine measures 4 feet 5 inches, the large 18 inches in length—proportions which differ from those found in *C. moloch*, where the large intestine measured 19 inches in a specimen whose small intestine was only 2 feet 11 inches long.

At the junction of small and large intestine is a cæcum (fig. 2), tapering gradually till within a short distance from the tip, where

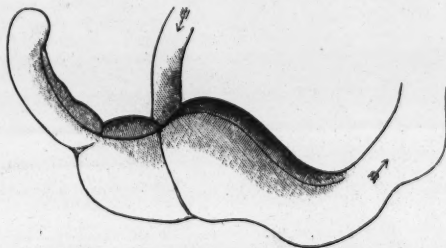
it shows a slight dilatation. There is no appearance of an "appendix vermiformis," such as was found in *Callithrix moloch* (cf. fig. 3).

Fig. 2.

Caecum of *Callithrix gigot*,  $\frac{1}{2}$  nat. size.

Professor Flower suggested to me that the enormous depth of the ramus of the mandibles in this *Callithrix* pointed to the existence of some arrangement resembling that of *Mycetes*. It was difficult to determine this point in a young female; but the swollen condition of the thyroid, together with the existence of a patch of ossification on each side, seem to show the possible existence of a howling apparatus in the male (see fig. 4).

Fig. 3.

Caecum of *Callithrix moloch*,  $\frac{1}{2}$  nat. size.

The *lungs* had a simple left lobe, the right lobe being divided by shallow fissures into three, and bearing also a small accessory lobe.

The *brain* was slightly more complex than that of *C. moloch*. On the outer surface of each cerebral hemisphere was seen a fissure of Sylvius (*Sy.*, fig. 5), behind which was a long *anterior temporal fissure* (*a.t.*); both being surmounted by an angular gyrus. There

is a small postero-parietal fissure, and a superofrontal which is very short. The occipital lobe exhibits traces of division into gyri.

Fig. 4.



Larynx of *Callithrix gigot*, ♀. jr. from the R. side,  $\times 2$ .

Fig. 5.

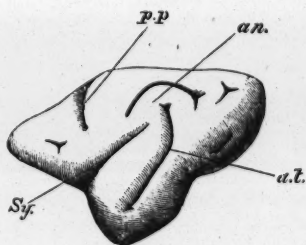


Fig. 6.



Brain of *Callithrix gigot*, natural size.

*Sy.* Fissure of Sylvius; *p.p.*, postero-parietal fissure; *a.t.*, antero-temporal fissure; *an.*, angular gyrus; *c.m.*, calloso-marginal fissure; *ca.*, calcarine fissure.

On the inner surface the calloso-marginal and calcarine fissures are simple and well developed.

3. On some Crustaceans from Mauritius. By E. J. MIERS, F.L.S., F.Z.S., Assistant in the Zoological Department, British (Natural History) Museum.

[Received December 12, 1883.]

(Plate I.)

M. V. de Robillard having recently forwarded to the Zoological Department a small but interesting collection of Crustaceans from Mauritius, the following notes on the species are laid before the Society, in continuation of the reports upon Crustaceans from the same locality sent by M. Robillard on two previous occasions<sup>1</sup>.

The collection comprised in all examples of only eighteen species; but of twelve of these, which were retained for the Museum, several have been hitherto *desiderata* in the collection; and one species, which I have designated *Callianassa martensii*, is, I believe, new to science. With three or four exceptions, however, the species have a wide oriental distribution.

Besides the species selected for the Museum, which are referred to in the following notes, there were in the collection specimens of *Menaethius monoceros*, *Schizophrys serratus*, *Trapezia ferruginea*, *Neptunus sanguinolentus*, *Thalamita crenata*, and *Podophthalmus vigil*.

The following is a list of the species included in the present report; those marked with an asterisk are such as I believe to be now recorded for the first time from Mauritius.

*Actæodes pubescens* (M.-Edw.). Indian Ocean (v. Martens).

*Chlorodius niger* (Forsk.). Oriental Region.

\**Trapezia flavopunctata*, Eyd. & Soul. Sandwich Islands.

*Lissocarcinus orbicularis*, Dana. Oriental Region.

*Xenophthalmodes mæbii*, Richters.

*Myra fugax* (Fabr.). Oriental Region.

\**Phlyxia erosa*, A. M.-Edw. Oriental Region.

*Dynomene hispida*, Desm. Oriental Region.

\**Callianassa martensii*, sp. n.

\**Penæus monodon*, Fabr. Oriental Region.

\**Solenocera lucasii*, S. Bate? S. of New Guinea.

*Leptosquilla schmeltzii* (A. M.-Edw.). Samoa Islands.

*Gonodactylus trachurus*, v. Martens. Pelew Islands.

ACTÆODES PUBESCENS.

*Zozymus pubescens*, Milne-Edwards, Hist. Nat. des Crust. i. p. 384 (1834).

*Liomera pubescens*, A. M.-Edwards, Nouvelles Archives du Muséum d'hist. naturelle, i. p. 223, pl. xii. fig. 6 (1865).

A specimen (adult female) referred to this species agrees with the descriptions and figure in nearly every thing except in the coloration,

<sup>1</sup> See P. Z. S. 1882, pp. 330-342, pl. xx., and pp. 538-543, pl. xxvii.

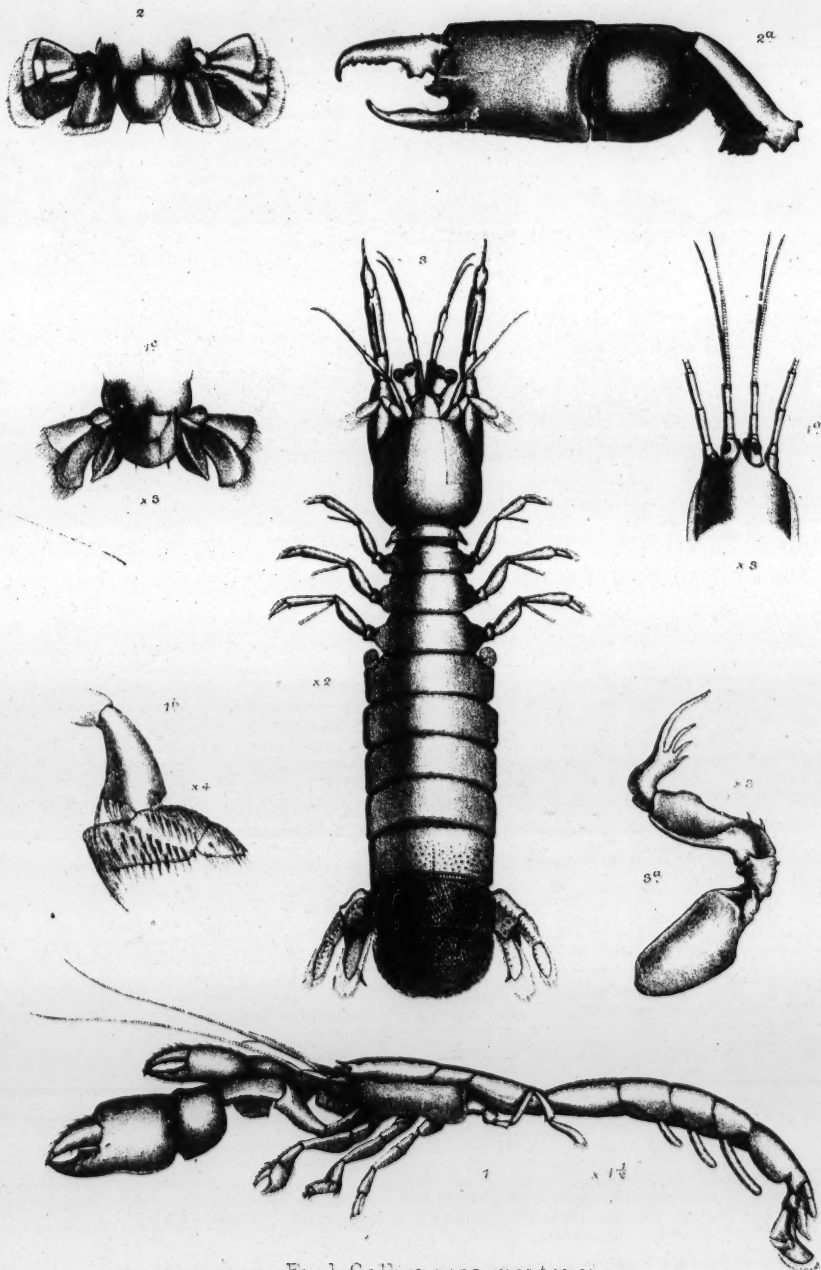


Fig.1. *Callinassa martensi*.  
Fig.2. *C. mauritiana*. Fig. 3. *Conodactylus trachurus*.



which in the specimen received from M. Robillard is of a bright rose-pink, the dorsal surface of the carapace covered with numerous rather large white spots, which are smaller near to the front and antero-lateral margins; the chelipedes are slenderer (a character probably due to the sex of the specimen). Milne-Edwards describes the coloration as whitish, but it is probable that his specimen was bleached.

The correct generic position of *A. pubescens* is doubtful; in external appearance (i. e. in the very widely transverse granulated carapace) it has altogether the *facies* of a species of *Carpilodes*, but the basal antennal joint does not, as in that genus, enter the inner orbital hiatus. It cannot, in the classification proposed by Prof. Dana (the only complete system since that of H. Milne-Edwards), be retained in *Liomera*, since the fingers of the chelipedes are strongly excavated. I place it therefore in the genus *Actæodes*, to which it belongs in essential generic characters.

This species has been hitherto a desideratum in the Museum collection.

#### CHLORODIUS NIGER.

*Cancer niger*, Forskal, Descript. Animalium, p. 89 (1775).

*Chlorodius niger*, Rüppell, Beschreib. 24 kurzschwanzigen Krabben des Rothen Meeres, p. 20, pl. iv. fig. 7 (1830); M.-Edwards, Hist. nat. des Crust. i. p. 401 (1834); A. Milne-Edwards, Nouvelles Archives du Muséum d'hist. naturelle, ix. p. 214 (1873), and ref. to *synonyma*.

*Chlorodius rufescens*, Targioni-Tozzetti, Zoologia del viaggio della R. piro corvetta 'Magenta,' Crostacei, p. 43, pl. iv. figs. 6-8, 10-12, 14, 18 (1877), var.

An adult male of large size of this common and widely distributed Oriental species is in the collection.

The characters mentioned by Targioni-Tozzetti as distinctive of his *C. rufescens* are, I think, not of specific importance. I have examined specimens in which the posterior lateral marginal tooth only is spiniform, and the other teeth of the lateral series are rounded and obtuse.

#### TRAPEZIA FLAVOPUNCTATA.

*Trapezia flavopunctata*, Eydoux and Souleyet, Voyage de la 'Bonite,' Zoologie, Crustacés, p. 230, pl. ii. fig. 3 (1841).

An adult male and female of large size are in the collection. They agree with the description and figure cited in nearly every particular, except in having no distinct carina on the outer margin of the merus of the chelipedes; the red areolations of the carapace and limbs (defining the yellow spots) are even larger than in the figure of MM. Eydoux and Souleyet.

This species is apparently well distinguished from *Trapezia areolata*, Dana<sup>1</sup>, by the extension of the areolæ of the body over the ambulatory

<sup>1</sup> U.S. Exploring Expedition, xiii., Crustacea, p. 259, pl. xv. fig. 8 (1852).

legs, and by having a series of granules or small tubercles on the inferior margin of the palm of the chelipedes. It has been hitherto a desideratum in the Museum collection.

The types of MM. Eydoux and Souleyet were obtained at the Sandwich Islands: hence it is evidently a widely-distributed Oriental species.

The largest specimen (the female) presents the following dimensions:—

	lines.	millim.
Length of carapace . . . . .	10	21
Breadth of carapace . . . . .	11½	24·5
Length of larger chelipede, nearly . . . . .	22	46

I believe the *Trapezia latifrons*, A. Milne-Edwards<sup>1</sup>, from the Sandwich Islands and New Caledonia, to be very probably a younger condition of this species. The carapace, however, is represented as broader and more triangulate in shape, the frontal lobes as less prominent, the lateral marginal teeth of the carapace as more acute, and the areolæ of its dorsal surface yet larger and less numerous. I therefore hesitate to quote it as synonymous with *T. flavopunctata*.

#### LISSOCARCINUS ORBICULARIS.

*Lissocarcinus orbicularis*, Dana, Proc. Acad. Nat. Sci. Philadelphia, p. 86 (1852); Crustacea in U.S. Exploring Expedition, xiii. (1) p. 288, pl. xviii. fig. 1 (1852); A. Milne-Edwards, Archives du Muséum d'hist. naturelle, x. p. 418 (1861).

A small male is in the collection, which in coloration and all other particulars nearly agrees with Dana's description and figure, based on a specimen from the Fijis.

#### XENOPHTHALMODES MÖBII.

*Xenophtalmodes möbii*, Richters, Decapoda in Möbius's Beiträge zur Meeresfauna der Insel Mauritius, p. 155, pl. xvi. fig. 29, and pl. vii. figs. 1-9 (1880).

Two females are in the collection.

This form has been hitherto a desideratum in the collection of the British Museum. I believe its true generic position to be in the family *Rhizopidae* in the vicinity of *Rhizopa* and *Typhlocarcinus*, Stimpson<sup>2</sup>; and perhaps it may not be generically distinct from one or the other of the above-mentioned genera, a point which, in the absence of males for comparison, I will not undertake to determine. In external aspect it altogether resembles *Typhlocarcinus*; it is distinguished, however, from all the species both of *Typhlocarcinus* and *Rhizopa* with which I am acquainted by the entire antero-lateral margins of the carapace. It has apparently no very near affinities with *Xenophtalmus*, White, with which Dr. Richters compares it; although

<sup>1</sup> Annales de la Société Entomologique de Paris, vii. p. 281 (1867); Nouvelles Archives du Muséum, ix. p. 259, pl. x. fig. 7 (1873).

<sup>2</sup> Proc. Acad. Nat. Sci. Philadelphia, pp. 96, 97 (1858).

bearing a close external resemblance to that genus; it is distinguished not only by the very different form of the orbits (which in *Xenophthalmus* are narrow and longitudinal, with a dorsal aspect), but also by the form of the buccal cavity and the exterior maxillipedes, concerning which nothing is stated by White. The buccal cavity in *Xenophthalmus* is antero-laterally arcuated, the ischium-joint short and broad, the merus as large as the ischium, narrowing to and truncated at its distal extremity, the following joint articulated with the merus at its summit, not at its antero-internal angle.

#### MYRA FUGAX.

*Leucosia fugax*, Fabricius, Ent. Syst. Supplemen. p. 351 (1798).

*Myra fugax*, Leach, Zool. Miscell. iii. p. 24 (1817); M.-Edwards, Hist. Nat. des Crust. ii. p. 126 (1834); Crust. in Cuvier, Règne Animal, pl. xxv. fig. 3; De Haan, Crustacea in Siebold, Fauna Japonica, p. 134, pl. xxxiii. fig. 1 (1841); A. Milne-Edwards, Nouvelles Archives du Muséum d'hist. naturelle, x. p. 45 (1874).

*Myra subgranulata*, Kossmann, Crustaceen in Zool. Ergebnisse einer Reise in Küstengebiete des Rothen Meeres, Brachyura, p. 65, pl. i. fig. 7 (1877), *vide* Hilgendorf.

An adult male is in the collection.

#### PHLYXIA EROSA.

*Phlyxia erosa*, A. Milne-Edwards, Journ. d. Muséum Godeffroy, iv. p. 86 (1873); Nouvelles Archives du Muséum d'hist. naturelle, x. p. 47, pl. iii. fig. 2 (1874).

Two adult females agree in all essential characters with the description and figure of Milne-Edwards, based on types from Bass's Straits and New Caledonia, and with specimens from Savage Island, and with others from the Fijis (H.M.S. 'Herald') in the collection of the British Museum.

#### DYNOMENE HISPIDA.

*Dynomene hispida*, Desmarest, Consid. générales sur la classe des Crustacés, p. 133 (footnote), and pl. xviii. fig. 2 (1825); A. Milne-Edwards, Mémoire sur les Crustacés Décapodes du genre *Dynomene*, p. 5, pl. viii. figs. 1-15 (ex Annales des Sciences naturelles, 6me série, Zoologie, 1878), and *references to literature*.

A small female is in the collection<sup>1</sup>.

#### CALLIANASSA MARTENSI, sp. n. (Plate I. fig. 1.)

This form in many of its characters is closely allied to *Callianassa tridentata*, v. Martens<sup>2</sup>, from Java, but is distinguished by the form of the penultimate joint of the third pair of legs, which is not trilobate as in the description of v. Martens, and in a specimen apparently belonging to *C. tridentata* from Ceylon, in the collection

<sup>1</sup> The British Museum has lately received a specimen of the rare *Dynomene predator*, A. Milne-Edwards, from Tamatave, Madagascar (*The Rev. Deans Cowan*). This species, which Milne-Edwards records from the Samoa Islands and New Caledonia, has been hitherto a *desideratum* in the Museum Collection.

<sup>2</sup> Monatsb. d. Akad. Wissenschaft. zu Berlin, p. 614 (1868).

of the British Museum (*E. W. H. Holdsworth, Esq.*), but simple, flattened and compressed, articulated with the preceding joint in the middle of its dorsal margin, and with the terminal joint at its distal extremity (see the figure).

The carapace, as usual in the genus, is laterally compressed, with the cervical suture strongly defined, the rostrum trispinose, the lateral a little shorter than the median spines. Of the segments of the postabdomen, the first, second, and sixth are longest, the sixth about as long as the two preceding segments taken together, whereas in the specimen referred to *C. tridentata* in the Museum Collection the sixth segment but little exceeds the fifth in length. The terminal segment is small, slightly transverse, and subtruncated at its distal extremity. The eyes project very slightly beyond the median spine of the rostrum and are bluntly pointed at their inner and distal angles; the cornæ are small and placed on the dorsal surface of the peduncles. The antennules are less than half the length of the antennæ; the terminal joint of the peduncle very slightly exceeds the penultimate joint in length; the inferior of the two flagella is fringed with long hair on its lower margin. The antennæ are about twice the length of the carapace; the antepenultimate peduncular joints bear a small spinule at the distal extremity on the outer margin; the penultimate and terminal joints are subequal. The left chelipede is the larger; the merus-joint is less than twice as long as broad, and its inferior margin is acute and serrated, but without strongly developed teeth or spines. The carpus is rather shorter than, but as broad as, the palm, smooth, its inferior margin acute and entire; palm rather longer than broad, smooth and polished, with the upper and lower margins fringed with hair, the lower margin acute; several tufts of *setæ* occur on its outer surface near to the base of the fingers, which are shorter than the palm, with the tips incurved; the uppermost arcuated, with the inner margin acute and entire, the lowermost with a small tooth or lobe on the inner margin, both clothed on their outer surface with several tufts of hair. In the smaller chelipede the joints are all much slenderer, and the merus-joint is not serrated on its inferior margin. The third legs have the antepenultimate joint armed with a low triangular lobe on the inferior margin; the produced posterior lobe of the hairy penultimate joint is broad and obtuse; the dactylus small, hairy, and subacute.

	lines.	millim.
♂. Length of the body, nearly . . . . .	22	46
Length of larger chelipede, nearly . . .	12½	26

In the specimen in the Museum Collection referred to *C. tridentata*, v. Martens, there is a strong tooth or lobe at the proximal end of the inferior margin of the merus of the larger chelipede. Nothing is said as to the existence of this lobe by v. Martens; but Milne-Edwards, in his monographic revision of the genus *Callianassa*<sup>1</sup>, describes *C. tridentata* as having the merus unarmed.

<sup>1</sup> Nouvelles Archives du Muséum, v. p. 101 (1869).

*Callianassa mauritiana*, described in my last notice of the Crustacea received from M. Robillard, differs altogether from *C. martensi* in the form of the front and larger chelipede (see fig. 2).

*Callianassa madagassa*, Lenz and Richters<sup>1</sup>, from Madagascar, is at once distinguished by the absence of lateral spinules from the front and the remarkable spinulation of the fingers of the right chelipede from *C. martensii*, and the form of the terminal segment and uropoda is very different from that of *C. mauritiana*<sup>2</sup>.

#### PENÆUS MONODON.

*Penæus monodon*, Fabricius, Entom. Syst. Supplementum, p. 408 (1798); M.-Edwards, Hist. Nat. des Crust. ii. p. 416 (1837); S. Bate, Ann. & Mag. Nat. Hist. (ser. 5), viii. p. 178, pl. xii. fig. 5 v. p. (1881).

An adult female of very large size was received from M. Robillard at the beginning of the year.

If Mr. Spence Bate is right in his synonymical citations as regards this species, it ranges throughout the Oriental Region.

#### SOLENOCERA LUCASII?

? *Solenocera lucasii*, S. Bate, Annals & Mag. of Nat. Hist. (ser. 5), viii. p. 185 (1881).

I refer to this species with much doubt a small female, which differs from Mr. Spence Bate's diagnosis in the somewhat more numerous and differently disposed teeth of the rostrum; and to facilitate its future identification (since the original diagnosis is in few words) I subjoin the following description.

Mr. S. Bate's type was dredged in 130 fathoms south of New Guinea, and is of much larger size.

Carapace nearly smooth, with the cervical and hepatic sutures distinct, and armed with a distinct antennal and a small hepatic spine, and with a small spine (the supraorbital?) on either side of the rostrum, placed a short distance behind the anterior margin of the carapace. There is no pterygostomian spine. The rostrum is shorter than the eyes (but broken at the tip), ascends very slightly from the base, and is armed above with eight or nine blunt serratures or teeth, whereof the three posterior are placed on the dorsal surface of the carapace and the last is separated by a much wider interval from the rest than these are from one another; there is no median dorsal carina on the carapace behind the last tooth. The eyes are moderately large; ophthalmopod setose at base on its upper surface. The segments of the postabdomen are nearly smooth, the fourth to sixth distinctly longitudinally carinated on the dorsal surface, and the third less distinctly so; the carina on the sixth segment ends posteriorly in a

<sup>1</sup> Abhandl. d. Senckenb. Naturforsch. Gesellschaft. xii. p. 427, figs. 20-23 (1881).

<sup>2</sup> The larger chelipede of *C. martensi* bears a very close resemblance to the mutilated fossil claw from the Trocadero, described and figured by A. Milne-Edwards as *C. parisiensis* (t. c. p. 99, pl. ii. f. 3); but *C. parisiensis* is too imperfectly known to be certainly identified with any recent species of the genus.

small spine; the postero-lateral angles are not acute in any of the segments; the terminal segment is obscurely longitudinally sulcated above, and is shorter than the *rhypidura* or appendages of the penultimate segment; it is acute at its distal extremity, and bears a pair of lateral spinules at some distance behind the apex. The antennules have the peduncle dorsally flattened and excavate for the reception of the eyes, the terminal joint is very short, the flagella stout, tapering very slightly, longer than the carapace, and the outer longitudinally concave for the reception of the inner flagellum, as in other species of the genus; the *scaphocerite* of the antennæ is slightly longer than the peduncle of the antennules, it narrows somewhat to the rounded distal extremity, and bears a small subterminal spine on its outer margin; the flagellum is wanting. The outer maxillipedes are slender and reach beyond the apex of the antennal scale. The legs of the first three pairs increase successively in length, they present nothing remarkable: the chelæ are very slender, with the fingers longer than the palm; the fourth pair have the merus-joints somewhat thickened, fifth and sixth joints not elongated, dactyli shorter than the sixth joint. The fifth legs are much longer than the carapace; fourth, fifth, and sixth joints all slender and much elongated; dactylus less than half the length of the carapace, and little more than half the length of the penultimate joint, and slightly compressed; the rami of the *rhypidura* are narrow, the outer longer than the inner, with a straight outer margin, the inner narrow-ovate.

	lines.	millim.
♀. Length of body about . . . . .	15	32
Length of fifth legs about . . . . .	12	25

#### LEPTOSQUILLA SCHMELTZII.

*Squilla schmeltzii*, A. Milne-Edwards, Journ. d. Mus. Godeffroy, i. (Heft 4), p. 87, pl. ii. fig. 7 (1873).

*Leptosquilla schmeltzii*, Miers, Ann. & Mag. Nat. Hist. (ser. 5), v. p. 13 (1880).

A small male of this species, hitherto unrepresented in the collection of the Museum, agrees in almost all particulars with the description and figure of Milne-Edwards, whose type was from Upolu. There can, I think, be no question of the generic distinctness of this form from the typical *Squilla*.

The median rounded keel of the terminal segment is more strongly developed, and the dactyli of the raptorial limbs are six-spined as in the figure cited, not seven-spined as in the description.

#### GONODACTYLUS TRACHURUS. (Plate I. fig. 3.)

*Gonodactylus trachurus*, V. Martens, Sitzungsber d. Gesellschaft. naturforschender Freunde zu Berlin (no. 6), p. 93 (1881).

An adult male is in the collection.

This species is evidently very nearly allied to *Gonodactylus bradyi*<sup>1</sup>,

<sup>1</sup> *Squilla bradyi*, A. Milne-Edwards, in 'Les Fonds de la Mer,' by MM. de Folin et Périer, i. (livr. ix.) p. 137, pl. xvii. fig. 11 (1869).

from St. Vincent, but is I think sufficiently distinguished by the following characters:—the fine acute spines of the penultimate and terminal segments are here replaced by conical or rounded tubercles, and the posterior half of the antepenultimate segment, which is represented as smooth and entire in *G. bradyi*, is granulated in *G. trachurus* on the dorsal surface and minutely spinulose on the posterior margin.

#### EXPLANATION OF PLATE I.

Fig. 1. *Callianassa martensi*, sp. n., male,  $\times 1\frac{1}{2}$  diam. (p. 13).

- 1a. Frontal region and antennæ of the same species, showing the form of the frontal spines,  $\times 3$  diam.
- 1b. Extremity of one of the legs of the third pair, showing the form of the produced posterior lobe of the penultimate joint and of the dactylus,  $\times 4$  diam.
- 1c. Terminal segment and uropoda,  $\times 3$  diam.
2. Terminal segment and uropoda of *C. mauritiana*, enlarged.
- 2a. Larger chelipede of *Callianassa mauritiana*, Miers, natural size.
3. *Gonodactylus trachurus*, v. Martens, adult male,  $\times 2$  diam. (p. 16).
- 3a. Raptorial limb (second maxillipede) of the same species,  $\times 3$  diam.

#### 4. On Races and Hybrids among the *Salmonidæ*.

By FRANCIS DAY, F.Z.S.

[Received December 24, 1883.]

In March 1882 I laid before the Linnean Society the results of some observations which I had made on the British *Salmonidæ*, tending to show that the number of species existing in these islands had been unduly multiplied by local races or varieties having been considered species. In the month of December I communicated to this Society some facts respecting the hybridization of Salmon and Trout, and likewise adverted to Sir J. Gibson-Maitland, Bart., F.L.S., having kindly instituted, on November 15th, 1882, three additional experiments upon crossing different forms of Charr, or Charr with Trout, the results of which, so far as they have gone, I propose describing this evening.

I have also to thank Sir J. Gibson-Maitland for permitting me to take examples of all the various crosses which have been made at Howietoun (many of which are on the table for examination), while he has also freely furnished me with information on all points, and access to his notes. There are likewise a series of *Salmonidæ* hatched in the great International Fisheries Exhibition, from eggs brought from Canada by Mr. Wilmot, the Canadian Commissioner, who gave me specimens at short intervals, so that I have a connective series. I shall have to refer to a pair of fine Trout sent to me in ice from the Otago Acclimatization Society, through the kind offices of Mr. Arthur, which are now preserved in spirit in the Economic Fish Museum at South Kensington. Lastly, I shall describe the *Salmo gracilis* of Couch (? Cuv. & Val.), a local race which I had the

opportunity of examining along the coast of Devonshire during the past half-year.

The first specimen I propose describing is a hybrid between *Salmo salar* and *S. leuvenensis*. On November 25th, 1879, as detailed by me previously (Proc. Zool. Soc. 1882, p. 751), a man arrived at Howietoun, sent over from Stirling by Mr. Napier, with some Salmon-milt obtained the previous night, and this was employed for the purpose of fertilizing some eggs from a 4-year-old Lochleven Trout. It is necessary to draw attention to the fact that the milt came from the Salmon, as the size of the spermatozoa is such as to generally render impregnation of Trout eggs difficult in the natural state. But here the milt had been brought in a bottle packed in snow or ice, and although the cold may have caused the size of the spermatozooids to contract, it appears to me more probable that the large eggs of these Trout possessed a comparatively large micropyle. Perhaps, as we find parr full of milt during the Trout-spawning season, the size of the spermatozooids preclude their impregnating the majority of the Trout-eggs which would be on the beds; for, although it has been computed that the absorbing powers of the ova extend over 30 minutes, the period during which the spermatozooids are alive in water is about  $2\frac{1}{2}$  minutes, and it is probable that for such a time the male Trout would hardly permit a parr to interfere with the redd.

One of the progeny of the above experiment, 11 inches in length, was captured in my presence at Howietoun, November 14th, 1882, and I subsequently described it in full (*l. c.*). In the island-pond two years since some more (which were the smallest fish) were placed, and when this pond was drained on November 28th, 1883, several were obtained. I sent three to the Economic Fish Museum at South Kensington; one I retained for personal examination. The specimen is on the table, and, although a year older than the one I described in 1882, is of the same length, while the others were slightly smaller; and investigations into the rapidity of the growth of these fish will form a subject for inquiry next year among those which still remain.

B. x. D. 12 ( $\frac{3}{8}$ ). P. 13. V. 10. A. 11 ( $\frac{3}{8}$ ). C. 19.  
L. l. 114. L. tr. 24/32. Cæc. pyl. 69.

	inches.
Total length of specimen .....	11·0
Length of head .....	2·0
Length of pectoral fin .....	1·5
Distance from snout to base of dorsal fin .....	4·2
Distance from snout to centre of base of caudal fin .....	9·0
Diameter of eye .....	0·4
Distance of eye from end of snout .....	0·6
Distance of eyes apart .....	0·7
Height of body .....	2·5

Preopercle forming an almost regular curve, with but very little appearance of a lower limb. Lower jaw very slightly hooked at its

extremity; a line from the end of the snout to the further point of the posterior end of the opercle passes just below the orbit; half the length of the upper edge of the subopercle equals its greatest depth. Maxilla of moderate strength, and reaching to below the hind edge of the orbit. *Teeth*—in a double row of about 6 on either side, pass along the anterior two thirds of the body of the vomer, while some are also on its head. *Scales*—12 rows pass downwards and forwards from the hind edge of the adipose dorsal fin to the lateral line; 21 rows pass from the lateral line to the base of the ventral fin. Rows of scales near the hind end of the fish irregular. *Colours*: very silvery, like a grilse, with 6 or 7 irregularly distributed rows of black spots on the anterior portion and upper two thirds of the body, decreasing to 3 or 4 at the end of the caudal region; no parr-marks on the sides. Two large black spots on the hind edge of the preopercle, 5 on the opercle, and 1 on the subopercle. A few small black spots on the top of the head. Lower two thirds of dorsal fin with large black spots and a white anterior upper edge; the fins generally greyish and darkest in the centre, the anal having a light front edge. Cæcal appendages of moderate size. Sex, male. Generative organs rudimentary.

Last year I also adverted in the same communication to 20,000 eggs of Lochleven Trout having been fertilized with Salmon-milt by Sir J. Gibson-Maitland on December 24th, 1881. These eggs were hatched on March 9th, 1882, or in 75 days, and on November 15th, 1882, about 1250 young were alive. I exhibited four specimens, varying in length from 3·4 to 4·3 inches. These fish have continued to do well, and are thriving in the upper and centre planked ponds at Howietoun, upwards of 800 being alive.

I obtained three specimens (on the table), which give the following measurements:—

B. x-xi. D. 13 ( $\frac{3}{10}$ ). P. 14. V. 9-10.  
A. 11 ( $\frac{3}{8}$ ). C. 21. L. 1. 118.

	No. 1. in.	No. 2. in.	No. 3. in.
Total length of specimens .....	7·3	5·7	5·4
„ „ head .....	1·6	1·2	1·15
„ „ pectoral fin .....	1·05	1·0	0·9
„ „ caudal fin .....	1·3	0·9	0·9
Distance from snout to base of dorsal fin ....	2·8	2·2	2·2
„ „ „ centre of base of caudal fin .....	6·2	4·9	4·6
Diameter of eye .....	0·3	0·23	0·25
Distance of eye from end of snout. ....	0·5	0·33	0·3
Distance of eyes apart .....	0·6	0·4	0·4
Height of body .....	1·5	1·2	1·0

Specimen no. 1 had the teeth in a double row along the body of the vomer. In examining the extent of the emargination of the caudal fin, it was 0·5 of an inch, while the length of the outer ray was

1.3 inch. *Scales*—12 rows between the adipose dorsal fin and lateral line. The direction of the rows of scales on the body rather irregular in places. Of a silvery colour along the back and sides, the upper half or two thirds of the body being spotted with black, some large red spots along the lateral line; three black spots on the opercle, and a fourth at its upper corner; one also on the preopercle. In certain lights 12 finger or parr-marks may be observed along either side; dorsal fin grey, with a white anterior edge at its upper margin, its lower half spotted with black; adipose dorsal orange, with a grey front edge; the other fins unspotted.

Specimen no. 2 was nearly similar in colour to no. 1, but a little more yellow; while it had 10 finger-marks on one side and 12 on the other; 14 rows of scales between the adipose dorsal fin and the lateral line; while the direction of the rows of scales on the body was irregular.

Specimen no. 3 was similarly coloured, except being still more yellow; it had 10 finger-marks on one side and 11 on the other; 2 black spots on the preopercle and 3 on the opercle; also many red spots on the body.

In these three undoubted hybrids the number of parr-bands along the sides varied from 10 to 12, while the direction of the rows of scales showed great irregularity. Both had 118 along the lateral line; but on the side of the tail they varied from 12 to 14 between the adipose dorsal and the lateral line.

Respecting the rate of growth of these fish as compared with young Salmon, it was found that the largest was a little over 7 inches long; while young *Salmo salar* in the next pond, a year older, were from 4 to 13½ inches in length.

Examples of young Salmon (*Salmo salar*) are at present at Howietoun in pond C, which is 130 feet long and has boarded edges. The eggs and milt from which these fish were raised were obtained by Sir J. Gibson-Maitland from the Teith in December 1880, and hatched at Howietoun in March 1881. There are a considerable number in the pond, and they have developed some very interesting phenomena. In July this year, in the presence of the foreign and other commissioners to the Fisheries Exhibition, this pond was netted, when it was seen that some of the young fish, then 2 years and 4 months old, were golden, spotted, and in the banded parr-stage, while others were beautiful silvery smolts almost ready to descend to the sea. Some of these parr-marked fish exceeded those which were in the smolt livery in size, although this was the exception.

During the first week in October one of these fish, under a pound in weight, and in the smolt colours, but with the parr-bands still visible in certain lights, jumped out of the pond and was found dead. On being opened it turned out to be a female with comparatively large ova, which were of a deep reddish colour—thus almost disposing of the statement that “no parr has ever been found with mature ova”<sup>1</sup>. Certainly the ova were not mature, but would have

<sup>1</sup> Günther, ‘Introduction to the Study of Fish,’ p. 639.

been had the fish not met with an untimely end; while the parr-marks were present, and so likewise were the silvery scales of the smolt. And as I shall show, we found at the end of November other females with ova, in all of which the parr-marks were visible.

At the end of November, when again at Howietoun, I was informed that several of the fish during the night or early morning had jumped out of the pond, and it was surmised that many had so perished, but been carried off in the early hours by birds and rats. At my first visit I was shown one which had been found dead that morning, and on the 29th there were two more, one of which (11·5 inches in length) had been partially eaten by some vermin, which had devoured the lower portion of its head. It was of a silvery smolt colour with parr-marks. On being opened it proved to be a male full of ripe milt<sup>1</sup>. A net was drawn through this pond for the purpose of examining the condition of the fish, and obtaining ova if possible, as well as milt for experimenting with. I examined three specimens, which are on the table:—

B. xi. D.  $\frac{3}{4}$ . P. 14. V. 9. A.  $\frac{3}{8}$ .  
C. 21. L. l. 117. L. tr. 21/30.

	No. 1. in.	No. 2. in.	No. 3. in.
Total length of specimens. ....	10·8	9·0	6·3
Length of head. ....	2·0	1·8	1·3
"    pectoral fin. ....	1·4	1·25	1·15
"    caudal. ....	1·8	1·6	1·15
Distance from snout to base of dorsal fin ..	4·1	3·5	2·5
"    "    "    centre of base of caudal fin. ....	9·3	7·9	5·2
Diameter of eye. ....	0·4	0·45	0·25
Distance of eye from end of snout. ....	0·6	0·55	0·3
"    eyes apart. ....	0·7	0·65	0·45
Height of body. ....	2·0	1·8	1·3

No. 1 was a beautiful silvery smolt with ten distinct parr-marks when placed in certain lights. One black spot on the preopercle, three on the opercle; the upper two thirds or half of the body spotted with black, as was likewise the lower half of the dorsal fin, which had a white anterior and outer edge. Pectoral fin nearly black in all these fish when alive. In this specimen the generative organs were not developed. The maxilla was more slender than in the hybrid of almost the same size, and which has been described. *Scales*: 11 rows from the adipose dorsal fin to the lateral line, and 20 rows from the lateral line to the base of the ventral fin. The extent of the cleft of the tail was 0·8, and the length of its longest ray 1·8. Its caecal appendages were longer than in the hybrids.

<sup>1</sup> "I am not quite sure but that milt and ova might be found in a hybrid; it has been found in parrs, and my theory is, that when this is so, the fish is the produce of a hen Salmon and a male river-Trout, as it was frequently found that a hen Salmon was spawning on the same gravel-bed with a male river-Trout."—Günther, evidence given June 4th, 1872, in 'The Parr and Salmon Controversy.' (Second Edition, 1883, page 128.)

No. 2 was more distinctly parr-marked, but otherwise very similar. It had 11 rows of scales between the adipose dorsal fin and the lateral line, as seen in the larger specimen. 19 rows of scales between the lateral line and base of ventral fin. The extent of the cleft of its caudal fin was 0.9, and the length of the longest ray 1.6.

No. 3 was in the parr livery with 10 well-marked finger-spots on either side, 3 black spots on the opercle. Fins as in the others, anal greyish in the centre. The upper jaw in the specimen a little shortened, due to injury. 11 scales in an oblique row from the soft dorsal fin to the lateral line. The fish was a male full of milt.

As a rule, the females were silvery, and were found to have ova, but not quite ripe, requiring from 4 to 6 weeks more. The males, on the contrary, on being pressed, gave ripe milt. The Salmonoids in these ponds seem to be more spotted than such as are obtained from rivers, and though perhaps not of large size are well proportioned. The largest taken in the net was 13.5 inches in length. As a rule, fish in the parr livery seemed to be males, most of which were ripe, while the silvery smolts were generally females; the finger-marks in all were perceptible. These fish made it very evident that the relative growth of the fry does not depend on the size of the pond, quantity of food, or amount of water, as all had been treated alike, yet they varied in length from 4 to 13½ inches.

Various reasons have been adduced in order to explain why a parr on becoming a smolt (normally about to migrate seawards) becomes of a silvery colour. Davy ('Philosophical Researches,' 1843, p. 250) suggested of the Salmon "that the young remain in fresh water till they have acquired not only a certain size and strength, but also additional scales, fitting them in their smolt stage to endure without injury the contact of the saline medium." Whether by acquiring "additional scales" he intended to mean an additional coat of scales, may be open to discussion, but as the body of the parr is fully scaled, such would appear to be the meaning. Couch, in 1866, observed that the silvery colour of Smolts is not due to their acquiring additional scales, but owing to a deposit of bright soft matter, which shines through the transparent scales. Günther (Intr. Study of Fishes, 1881, p. 632), however, remarks, respecting the river-Trout, that they "frequently retain the parr-marks all their lifetime; at certain seasons a new coat of scales overlays the parr-marks, rendering them invisible for a time, but they reappear in time, or are distinct as soon as the scales are removed. When the Salmones have passed this Parr-stage," we are distinctly informed that "a new coat of scales overlays the parr-marks;" but as these fish do not shed their scales, he seems to advance that an additional or extra coat of scales is developed at certain periods, an opinion, as I believe, held by Davy, but denied by Couch<sup>1</sup>.

<sup>1</sup> I have received the following communication from Dr. Gadov:—"The development of the scales in Teleostean fishes, as in the Salmon, &c., is as follows:—The cutis (together with the superimposed epidermis) at first forms a slight elevation, the upper or top end of which assumes a backward direction, and this growing or young scale soon ossifies, but not so completely as in Sharks

On examining an American Charr, *Salmo fontinalis*, in the parr-stage, and  $3\frac{1}{2}$  inches in length, the scales covering the body on their outer surface were found to be covered and bound down to one another by a covering of epidermis (which in its turn was much concealed by a thick layer of mucus); the same appearance was present in a *Salmo levenensis* 4 inches in length, while in a Salmon-parr, 6 inches long, a change had commenced in some regions of the body. The hind portion of the exposed part of each scale, sometimes to as much as one third or even one half, being silvery, or rather transparent, permitting the silvery lustre to shine through, but not so the basal portion, which retained more of the parr-colour. On placing a needle under these scales, the transparent or silvery part could be readily elevated; it was no longer bound down by epidermis, as in younger fish, while but very little mucus was present. Among the silvery smolts this apparent denudation of the scales had been carried to a greater extent, the epidermis being seemingly merely present across its base (except where black or orange spots existed), and as a consequence a silvery scale with more or less dark edges was seen. Should the scale of a smolt be raised, it appears as if on the sides and most of the body of the fish it were merely attached at its base and placed in a pocket of the epidermis, and nowhere in the body is any new layer of scales developed, or an increased thickness put on, but, on the contrary, the epidermal covering seems to become removed in the smolt-stage, thus occasioning their transparent and consequent silvery appearance, which is continued through life. Owing to the epidermis being less removed from the scales of the back, and being present over the scaleless head, these portions retain a darker colour.

A hybrid between *S. salar* and *S. levenensis*, at 7.4 inches in length, shows a portion of the outer edge of each scale already denuded of epidermis; and although I do not propose in this paper to enter upon the question of colour, I may remark that the lateral bands or finger-marks come into more prominent view when the scales and attached epidermis are removed, rendering it probable that they are found in the cutis. The black spots, or at least some of those which are seen on the body, are in the epidermis, and can be removed with that structure; while on removing a scale, the epidermal pocket in which its base lies is found of a dark and often black colour. If the epidermis of a young fish is placed under the microscope, it is more or less filled with fine black dots; consequently the absorption of this structure, irrespective of its leaving the silvery portion uncovered, removes what must add a darker tinge to the fish. In like manner a portion of the red or orange dots may be external to the scales, as in the epidermis or in the structures below

---

and Ganoids. The scales increase in size by apposition, their basal portion forming the matrix being part of the cutis, in a similar way to finger-nails growing out of the nail-fold. There are two main classes of these scales, one retaining an embryonic condition, as in some parts of a Mackerel, &c., while those of the Salmon, which attain a larger size, break through the epidermal layer, and thus become partially free."

them; while the male Salmon-parrs at Howietoun have developed a white anterior edge to the dorsal and anal fins.

These young migratory Salmon conclusively show that the females, without descending to the sea, may develop eggs in fresh water. And though we know that in the case of rivers in which their access to the sea has been cut off, or their migrating to the ocean prevented from any cause, these fish have usually disappeared from such streams, still we are aware that land-locked Salmon are found in various parts of the globe. It does not seem a visionary dream, but within the bounds of a measurable distance, to anticipate that some Howietoun-reared fish may in a few generations develop land-locked forms, invaluable to the upper waters of some of our rivers in which migrations seaward are now impossible; while they will also afford the upper riparian proprietors a chance of securing a breed that will remain in their waters, and cannot therefore be destroyed, as they are now at the mouths of rivers, and in the estuaries, by unscrupulous fishing.

Before proceeding to discuss the use made of the milt of these fishes, I propose adverting to another series of Salmon, bred at the Fisheries Exhibition, from eggs brought from Canada by Mr. Wilmot, the Canadian Commissioner, who has kindly given me a series.

For the purpose of exhibiting the interesting modes of fish-hatching now being carried on in Canada, Mr. Wilmot brought over a considerable number of ova in ice. These, however, commenced hatching a few days prior to the opening of the building, and continued doing so up to May 23rd.

All these fish had a double row of teeth along the body of the vomer, from about 112 to 118 rows of scales along the lateral line, from 11 to 12 rows between the adipose dorsal and the lateral line, and 20 rows from the lateral fins to the base of the ventral line. The following give the lengths of the fish, all of which I saw removed from the hatching-trough, as well as the number of bars along their sides.

	Length of fish. inches.	Bars on side.	Bars on side.
August 24, 1883. . .	2·3	9	8
	2·2	9	9
	2·0	10	9
	2·0	8	10
	1·7	8	10
	1·6	8	9
	1·5	9	10
	1·4	8	8
	2·9	9	8
	2·9	8	8
September 27, 1883..	2·5	7	7
	2·3	9	9
	2·3	7	8

	Length of fish. inches.	Bars on side.	Bars on side.
October 27, 1883 . . . .	{ 3·3	7	8
	{ 2·9	9	8
	{ 2·8	8	9
	{ 2·8	8	8
	{ 3·5	8	8
November 15, 1883 . . .	{ 3·2	9	9
	{ 3·0	9	10
	{ 2·8	8	8
	{ 2·8	8	7
	Average . . . .	8½	8½

It would appear, from the foregoing, that out of 22 specimens of Mr. Wilmot's young Salmonidæ, the number of parr-bars varied from 7-10, frequently differing in numbers in the two sides of the same fish, while the average was 8½, a remarkable difference from what obtains in the British *Salmo salar*, a question I shall refer to again further on. I may, however, mention here that in some of these fishes the bars were much broken up. The adipose fin in almost all had a leaden-coloured base, the outer two thirds being orange-coloured.

When leaving Teignmouth in Devonshire, in 1882, I had the opportunity of seeing, but not of procuring, two or three long and lanky Salmon, having much the appearance of kelts. I had, however, to postpone my investigations, and went there in August this year, when I was so fortunate as to find the same class of fish, not only in the market there, but also at Torquay, where I went likewise to inquire respecting these fish. In fact, out of the many Salmon which I saw, all were of this local race, evidently the *Salmo gracilis*, Couch, whose examples were taken in the Fowey. Yarrell, on being sent a figure of Couch's fish, replied, "I have a skin of a Salmon that would have been a good match for your female. This was a Salmon that had been detained in a fresh-water pond rather more than three years." Yarrell suggests the water did not suit Couch's fish, but the latter author observes, "It had just come from the open sea," and that the Fowey water is not polluted with poisonous water from mines. It appears to be a variety or local race of *S. salar*.

	Length. inches.	Length of head. inches.	Depth of body. inches.	Weight.
August 21, 1 female . . . .	28·0	5·2	5·0	6 lbs.
" " . . . .	27·5	5·2	5·2	7½ lbs.
August 27, 1 male . . . .	26·0	4·8	4·0	4 lbs.
" 1 female . . . .	24·0	4·5	4·0	4 lbs.

In the foregoing the proportion of the depth of the body to the total length was about 6½ times.

A pair being required for the New South Wales, Sydney, Museum,

Mr. Ramsay and myself procured them; the proportions were as follows:—

	Male.	Female.
	inches.	inches.
Total length of specimen .....	26·0	24·0
Length of head .....	4·8	4·5
Height of body .....	4·0	4·0
Distance between end of snout and commencement of dorsal fin .....	10·0	9·0
Length of caudal fin .....	3·0	3·5
Diameter of eye .....	0·8	0·5
Distance of eye from end of snout ..	1·5	1·5

These fish had from 118 to 120 rows of scales along the lateral line; the male had 10 rows, and the female 11 between the posterior end of the base of the adipose dorsal fins, passing downwards and forwards to the lateral line. The male had 61, and the female 71 cæcal appendages. The eggs in the female were about  $\frac{1}{20}$  of an inch in diameter, but there were many smaller ones. The milt in the male was appearing, while a small hook was apparent at the end of the lower jaw.

Cooked, they were good fish, not so rich as Salmon from more northern rivers, and of a very slight pink tinge in the flesh. Under what conditions these fish are so elongated, whether from climatic causes or from food, are problems requiring solution. It has been asserted that along the south coast pollution of the river-water is the chief cause<sup>1</sup>. It has been generally accepted, that bad, insufficient, or unsuitable food, as well as prevention of descending to the sea at certain periods, will often eventuate in lanky fish, but I do not think that it is generally known that an elongated sea-going race of *Salmo salar* exists.

The Lochleven variety of Trout is that with which Sir J. Gibson-Maitland has had such marked success at Howietoun; and by keeping those bred in different years by themselves, some exceedingly interesting results have already been ascertained, the prelude possibly to many more. The first of these fish to which I propose adverting are those which are the elders of the fishery, and were hatched in

<sup>1</sup> A correspondent in the 'Field' (January 5, 1884, page 16) observes:—"I have conversed with several old Devonshire anglers, who sadly recall the days of their youth, when they could reckon with a moral certainty on catching two or three Salmon in the Teign with the artificial fly, on any fair fishing day, before the mines had poisoned the river, and who have since then seen a large tract of the stream, extending over three or four miles, so thickly fouled with mine-washings, as to become as lifeless as the Dead-Sea waters. Salmon could not swim or live in such waters for many years. During all this interval the river of course was utterly destroyed for Salmon-fishing, but, strange to say, since the mines have been worked out, some few straggling fish have begun to return in gradually increasing numbers during the last three or four years; but the taint of the poison still lingers there, and this peculiarity remains, that the flesh of a Teign Salmon is hard and woolly, and utterly devoid of that curded richness which lies between the flakes of a well-dressed fresh-run Severn Salmon."

1875, and placed in the island-pond in 1879, when it was finally completed. This pond is  $210 \times 90$  feet, and from 10 to 11 feet deep in the centre.

One can hardly assert that the fish thus kept have been under the same conditions of existence as if they had been in a wild state in Scottish waters. Always provided with food, they may have thus been somewhat stimulated, and their powers of propagating their species accelerated. This may tend to shorten life, as sterility in fishes appears to lengthen it. It has been apparent that males experience a larger mortality than females, due apparently to exhaustion after breeding, which seems to be assisted by their pugnacious propensities.

I last year remarked upon the fact observed at Howietoun, that, as a rule, the Lochleven variety of Trout gave eggs of different sizes in accordance with the age of the parents. Those which were hatched in 1876, or six years old, were producing ova 32 of which filled the length of a glass quill, whereas those which were hatched in 1875, or seven years old, gave ova 27 or 28 of which occupied the same space.

Since then I have come across several interesting statements, which fully bear out the observations made at Howietoun. In the Report of the United-States Fish Commission on the McCloud River, for 1878, it is observed that "the parent Salmon were unusually small, their average weight being under eight pounds. This small size was stated to be undoubtedly caused in whole or in part by the fishing at the canneries of the Sacramento, where the 8-inch meshes of the innumerable drift-nets stopped all the large Salmon but let all the small ones through. The eggs when taken proved to be at least a third smaller than those of most previous years, and the average number of eggs to the fish was about 3500 against 4200 in the previous year." In this case the diminished size of the parents may have not only conducted to diminished size of the ova, but likewise to a decreased amount, for the number generally is proportionate to the weight of the parent fish.

Livingston Stone adduces another reason for this result, namely, that American Trout, *Salmo fontinalis*, living in spring water (which means deficient food) develop smaller ova than such as reside in brook water. That is, poverty in food has the same effect in diminishing the size of the eggs as if the parent had not yet arrived at full sexual maturity.

I adduce these instances because assertion has been so confidently made to the contrary, and it is perhaps as well to be able to bring forward facts observed at different places by different observers who are not acquainted with the views of one another. Malmgren having observed that the ova of *Trutta relicta* are considerably smaller than those of the Salmon, Dr. Günther remarked in the 'Zoological Record' (1864, pp. 180, 181) as follows:—"Thirdly, as Hr. Malmgren observes, in the size of the ova. The last character will be considered very significant by all who may have a more extensive knowledge of fishes, as the size of the ova is not only invariably the same in

individuals of whatever size, but, as far as our experience reaches, is even often characteristic of the species of a genus". Likewise, in his 'Introduction to the Study of Fishes,' 1880, p. 159, he observes, "The ova of Teleosteous Fishes are extremely variable in size, quite independently of the size of the parent species. The ova of large and small individuals of the same species, of course, do not differ in size."

This brings us to the consideration of whether it is possible that increased size of eggs may lead to augmented size of offspring, irrespective of the question of changing the locality they inhabit, or increasing the space or amount of water in which they reside.

The following interesting experiment was instituted fourteen months since by Sir James Maitland. Two batches of Lochleven Trout were spawned in the winter of 1882 on November 2nd, the parents of one having been hatched in 1875, and of the other in 1876. The eggs were similarly treated, and hatched in January and February 1883.

In the garden in front of Sir J. Maitland's house at Craigend two ponds have been constructed for the reception of young fish, each of the same width and 100 feet long; one is nearly on a level with the other, and the same stream runs through each. Into these ponds the two lots of fry were turned—those from the older or 1875, or seven years' old parents, having the lower pond; those from the younger or 1876, or six years' old parents, having the upper pond, while they were fed and treated in an identical manner.

On November 29th we examined these two ponds, the fry in the upper of which, or from the younger parents, seemed to average about  $2\frac{1}{2}$  inches in length, while those in the lower pond appeared to average about  $3\frac{1}{2}$  inches in length; showing that from the eggs of the older parents had emanated the more satisfactory offspring.

We next proceeded to draw a net through each pond; and I selected three young fish from the upper and five from the lower series as among the finest examples of each batch. These fish gave the following results:—

Upper pond, from 1876 parents.

Length. inches.	Bars.	Bars.
3·5	13	13
3·0	13	12
2·9	14	13
Average . . . 3·1	13 $\frac{1}{2}$	12 $\frac{2}{3}$

These fish were more spotted than those in the lower pond and had more red marks. The dorsal fin had a white front edge, as in young Brook-Trout

<sup>1</sup> Genus *Brachymystax*, Günther. "Even if *Salmo fluviatilis* should prove to be the male of *Salmo coregonoides* (the type of the new genus), still the small size of the ova would be a character of sufficient importance to separate these fishes generically from *Salmo*." Catal. Fish. Brit. Mus. vi. p. 163.

## Lower pond, from 1875 parents.

	Length. inches.	Bars.	Bars.
No. 1.....	4.0	13	12
No. 2.....	4.0	14	12
No. 3.....	3.8	11	12
No. 4.....	3.9	13	14
No. 5.....	3.9	12	13
Average....	3.9	13 $\frac{3}{8}$	12 $\frac{3}{8}$

These fish had the parr-bands somewhat more broken up than those in the upper pond, while the bands varied from 11 to 14; they were otherwise similarly coloured.

If these averages are reliable, and I consider them to be so, among the thousands of fish I saw in these two ponds, the increase or difference or gain in length by selection of parents was nearly one fourth of the total length of the fish at nine months of age, or in those whose parents were hatched in 1875 over those whose parents were hatched in 1876. As these larger-bred fish are likely to form a larger race, a sufficiency will be retained for breeders; time, however, can only show to what extent this will be realized.

But although experience has shown that the eggs of the older fish produce larger fry, and such as are better calculated to fight the battle of life, the problem had to be solved up to what age can breeding from Trout be continued with a reasonable prospect of remuneration; for it is clear that keeping sterile or scarcely prolific fish would hardly be advantageous, while as soon as a diminution of the vital powers sets in, it is reasonable to suppose that the limit of obtaining the finest offspring has been reached. Some of these questions seem to have met with a most unexpected answer this year at Howietoun, where the old fish have experienced a most extraordinary mortality, not simply due to fungus<sup>1</sup>, but apparently consequent upon age. First the males of these eight-year-old fish commenced to succumb<sup>2</sup>, subsequently the females, many of which latter were egg-

<sup>1</sup> Fungus appears to attack most virulently old males and unspawned females, but very rarely young fish. It would almost seem nature's mode of clearing off kelts, which feed on the young fish, and are consequently injurious to salmon-rivers. This likewise accounts for the fact that in certain rivers where the disease has been most virulent, the succeeding year's supply of Salmon has been abundant. Possibly there will be less monsters in number, the remnants of last year's kelts, but the amount of moderate-sized fish will more than compensate for this.

<sup>2</sup> In a letter from New Zealand in the 'Field' (Dec. 15th, 1883) it is observed:—"In a great many of the creeks, after the fish get to 6 pounds weight, they seem to fall off in condition and get long and thin, and grow greatly to head." Now is this due to age or feeding? If we take 8 years as about the age at which Trout fall off, and deduct this from 1883, we come to 1875. The first *Salmo-fario* ova which arrived in safety at Melbourne and Tasmania were in 1864, and we are told that "during the years 1873, 1874, 1875, and 1876, . . . 33,850 Trout ova and fry have been distributed to suitable streams in Tasmania, New Zealand, Victoria, New South Wales, and Western Australia" (Nichols, 'Acclimatization of the Salmonidæ at the Antipodes,' 1882, p. 85).

bound, not a few were sterile, while the number of eggs from those ripe for breeding were, fish for fish, less than in 1882. Taking all things into consideration the time appeared to have arrived when the paying value of most of these Trout had come to an end, and it was decided that they could no longer be kept with advantage. The sluice was therefore opened on November 27th, and the next morning we proceeded to the pond to select such fish as were worth preserving and spawn such as proved to be ripe.

On arriving at the pond the water was found to have nearly run down, and in the mud at the bottom were many dead Trout, not short of 100, the majority of which were about two feet in length, some kelts, some egg-bound females, while a few were floundering in the mud. On removing with a net the remaining fish, it was observable that a change in the colour of some had occurred; and the same change was observed among some of the 1876 Lochleven Trout—namely, that the anal fin had a white edge and the anterior-superior margin of the dorsal fin was also white, thus reverting to the Brook-Trout form of colour. Attention may likewise be drawn to all the hybrids between this form of Trout and the Salmon possessing a white edge to the dorsal and anal fins. Those who consider colour as indicating a specific difference in these fish differentiate the Lochleven from the Brook-Trout by the latter possessing a white edge to their fins, which is deficient in the former. These old and undoubted Lochleven fish are throwing back in colour to the Brook-Trout livery; and likewise among the crosses between this variety and the Salmon we find the white edge to the fins as seen in the Brook-Trout invariably present, although absent from the parents.

On placing a net in the ditch into which the island-pond drained, a considerable number of Trout-ova were found in it. Whether these were from the bottom of the pond, or whether an old female had got jammed in the valve and her eggs discharged, it was not possible to say, but they were white and opaque, as if they had been exuded longer than 12 hours.

Forty-two large Trout had to be killed as evidently passé, and about 300 of the remainder were removed to another receptacle. The small amount of fertile males was remarkable; while all the old ones had the hook at the end of the lower jaw. Among the fish in this pond were some of the hybrids between the Salmon and Trout, bred from ova taken in November 1879, and already adverted to.

On November 15th, 1882, Sir J. Gibson-Maitland in my presence obtained about 2000 ova from a Lochleven Trout, which were fertilized with milt from an American Brook-Trout, or Charr, *Salmo fontinalis*. These were placed in hatching-box no. 108, and on November 29th, 1883, about 150 were alive. They had been transferred to a large wooden rearing tank through which a stream of water flowed. The mortality among these 2000 eggs had been as follows:—November 68, December 142, January 89, February 41, or a total of 340 eggs. The young were much malformed, monstrosities being numerous, blindness in both or in a single eye, and bull-

dog deformities of the snout being the most perceptible: some were very light-coloured, but not quite albinos, as the markings, although pale, were visible; and in such as have survived this want of colour still continues.

In May 1883 I received from Sir J. Maitland one of these fish from the hatching-house: it was 0·8 of an inch long, the anterior portion of its head deformed from want of development of the pre-maxillaries and contiguous bones; its colour was white without any markings.

July 20th, 1883, I removed from box 108 some more of these fishes, which were as follows (in inches and tenths):—

	No. 1.	No. 2.	No. 3.	No. 4.
Total length .....	1·7	1·7	1·7	1·6
Length of head .....	0·4	0·3	0·4	0·4
Length of caudal fin ..	0·3	0·25	0·3	0·3
Height of body .....	0·3	0·3	0·3	0·3
Number of bars .....	8 & 9	9 & 11	9 & 9	9 & 10

November 29th, the following three fishes were removed from the box:—

Total length .....	2·7	2·6	2·2
Length of head .....	0·6	0·6	0·4
Length of caudal fin..	0·4	0·5	0·3
Height of body .....	0·5	0·55	0·4

No. 1 was blind of the left eye, but no perceptible difference could be seen in the colours of the two sides, which were similar to those in No. 2, except having two bands instead of one across the dorsal fin. There were 17 rows of scales between the posterior extremity of the base of the adipose dorsal fin, passing downwards and forwards to the lateral line: in Trout there are normally from 13 to 15, and in American Charr from 21 to 26.

No. 2 had the eyesight apparently normal. The finger-marks along the sides were broken up into arched bands or circles enclosing spaces, the ground-colour being yellowish; the upper surface of the head and back spotted and marked with black dots; the rayed dorsal fin with a dark band across its centre and a dark spot at the base of its first ray. There were 22 rows of scales between the adipose dorsal fin and the lateral line.

No. 3 had the right eye lost, the ball having retracted into the socket; while the left eye was almost blind, the pupil being reduced to a small slit, while a black-coloured spot was present on the sclerotic. When alive this fish appeared as one of the semi-albinos which I have referred to: the markings were present, but light on both sides, more especially so on the right. There were 15 rows of scales between the adipose dorsal fin and the lateral line.

On November 15th, 1882, 8000 ova were taken from an American Charr, *Salmo fontinalis*, which were fertilized with milt from a Lochleven Trout as in the last experiment, the eggs and young being

similarly treated. These eggs were placed in box 104, and on November 29th, 1883, 16 remained alive. The mortality among these 8000 eggs was as follows:—November 28, December 575, January 1818, February 297, or a total loss of 2718. The young fry were greatly deformed, many had their spines crooked, atrophy of its posterior portion, and a deficiency of the fins generally, more particularly of the caudal.

May 1883, the young were about one inch in length and had about 11 finger-marks, the foremost four of which were mostly below the lateral line, while the remainder generally crossed it. I received one specimen from Sir J. Maitland, which was 0·8 of an inch long: its head and the anterior portion of its body was natural, but posterior to the dorsal fin a general atrophy had occurred, and although the anal fin was fairly developed, the caudal portion was embryonic. It had six bars along each side.

July 20th, the cross bands had become much wider, passing downwards to the belly and upwards towards the back, which, however, they do not reach, but small and irregular bands descend towards the spaces between the cross bands. The broad cross bands on the sides of the body are twice as wide as the interspaces, generally about nine in number, while another crosses over the head, covering a portion of the gill-covers, and a dark band runs along the middle of the dorsal fin. I removed three from the boxes, which were of the following sizes (in inches and tenths).

	No. 1.	No. 2.	No. 3.
Total length .....	1·8	1·6	1·5
Length of head .....	0·5	0·35	0·4
Length of caudal fin ..	0·3	0·25	0·3
Height of body .....	0·5	0·3	0·3
Number of bars ....	8 & 10	10 & 11	9 & 8

November 29th, the following fish was removed from the remaining 16.

Total length .....	2·1 inches.
Length of head .....	0·5 inch
Length of caudal fin ....	0·4 „
Height of body .....	0·4 „

The finger-marks in this specimen appear to have been about 12, but are broken up into irregular shapes, reticulating over the body, which is of a yellow colour. Similarly along the back the fish appears covered with black spots on a yellow ground. Dorsal fin with two oblique black bands, a light upper edge, and a dark spot at the base of its first dorsal rays. There were 15 rows of scales between the adipose dorsal fin and the lateral line.

It is interesting to observe that about one in six of the eggs of the Lochleven Trout impregnated by the American Charr failed to hatch, but double that number, or one in three, of the American Charr-eggs

impregnated from Lochleven Trout-milt. The same reason which appears to militate against Trout-eggs being impregnated by Salmon-milt probably is the cause, *i.e.* the size of the spermatozoa. Thus the comparatively large Lochleven Trout-eggs were fertilized from the milt of the Charr; but when the converse was tried the success was much less. As the American Charr-eggs are much smaller than those of the Lochleven Trout, it is reasonable to suppose the spermatozoa are also smaller, and consequently were readily absorbed; but when it was attempted to fertilize the *Salmo fontinalis* by the milt of *S. leuvenensis*, probably the large spermatozoa did not readily find entrance, thus accounting for the great proportion of unhatched ova.

Among the *Salmo fario*, or Brook-Trout, which in the upper pond are going on for 8 years of age, a considerable amount of fungus was present. It has been observed, similar to what obtains in the Lochleven variety, that the size of the eggs augments with age.

An exceedingly interesting subject of investigation is whether we possess several or only one species of River-Trout. The foregoing descriptions of hybrids show that, although neither the Salmon nor Lochleven Trout possesses white edges to the dorsal and anal fins (such being usually restricted to the Brook-Trout), hybrids between the two appear invariably to be so marked. This year's investigations at Howietoun have likewise shown that such a mode of colour may occur in old Lochleven Trout, especially males.

I have several times observed that all lines of demarcation between the recorded species become obliterated should the ova of these fish be transmitted to foreign lands, where, due to changes in diet, temperature of the water, and other causes, *Salmo ferox* may be raised from the egg of our common Brook-Trout. The first and last arrival of the eggs of the British Brook-Trout (*Salmo fario*) at Tasmania occurred April 24, 1864. Some of these ova were collected by Mr. Frank Buckland from fish in the stream running through Admiral Keppel's garden on the Itchen in Hampshire, while Mr. Francis Francis's were obtained from a mill at Alton on the Wey, and from Mr. Thurlow's mill at High Wycombe, Buckinghamshire; and Mr. Arthur tells us that the first successful Trout-hatching in Otago occurred in October 1868, from 800 eggs obtained from the natural spawning-beds of *Salmo fario*, in Tasmania. These, and a second lot the subsequent year, formed the whole of the original stock which were first liberated in the streams in November 1869. As these Trout were raised from eggs derived from our southern or smallest variety, where the great Lake-Trout, *S. ferox*, is not found, it is clear that *S. ferox* ought not to be present in Otago, unless this latter fish is merely a variety of our Brook-Trout.

Mr. W. Arthur most kindly forwarded to me, in ice, from the Otago Acclimatization Society, by S.S. 'Tonic,' which left Lyttelton, New Zealand, on July 9, 1883, two specimens of Trout recently taken, this being their spawning season. "They were got in a small river not 20 feet wide, which runs into a freshwater lake,

Lovells Cruter, a feeder of the Tuakitoto Lake, situated about 15 miles from the sea. They are large fish in good condition: the male weighs 16 to the female 12 pounds. These fish have evidently not been frequenting brackish or saline waters, at least the total absence of  $\times$  spots is, I suppose, according to the authorities, proof of such a fact, and the spots of these fish now sent are round and oval. I observed that the vomerine teeth are all gone, and only one or two ancient tusks still on that bone of the female; so age affects teeth similarly to migratory habits."

The following are the characters of this pair of Trout, which were received in excellent condition, and are now preserved in spirit in the Economic Fish Museum:—

*Male.* Length of fish . . . . .  $32\frac{1}{2}$  inches.  
 " head . . . . .  $6\frac{1}{2}$  "  
 " caudal fin . . . . .  $4\frac{1}{2}$  "  
 Height of body . . . . . 7 "

*Eye.* Diameter 1 inch, 3 inches from end of snout, and 3·2 inches apart.

L. l. 118, and 12 rows of scales from the adipose fin, downwards and forwards to the lateral line. *Teeth* none on the vomer, some on the palate, some on the tongue in two rows, four in each. The maxillary reaches to  $\frac{3}{8}$  of a diameter behind the eye. *Colours*: dark spots over the body, shoulder, and dorsal fins.

*Female.* Length of fish . . . . .  $31\frac{1}{2}$  inches.  
 " head . . . . .  $6\frac{1}{4}$  "  
 " caudal fin . . . . .  $4\frac{1}{2}$  "  
 Height of body . . . . .  $6\frac{1}{2}$  "

*Eye.* Diameter 1·55 inch, 1·6 inch from end of snout, and 2·4 inches apart.

L. l. 120; 14 rows of scales from the adipose fin downwards and forwards to the lateral line. *Teeth*: a few on the front of the vomer. Caudal fin emarginate. *Colours*: spotted all over the body.

These two beautiful specimens of Trout are so exceedingly similar to so-called Lake-Trout, that any ichthyologist who believed in the numerous species of this fish, and was unaware from whence they came, would undoubtedly term them *Salmo ferox*.

As a considerable stress has, erroneously I believe, been laid upon the number of cæcal appendages among the Salmonidæ, as diagnostic of species, I give the following table:—

Dr. Günther.	Anadromous forms.	<i>Salmo salar</i> .....	Cæc. appen. 51-77.
"	"	— <i>argenteus</i> .....	" 61-67.
"	"	— <i>trutta</i> .....	" 43-61.
"	"	— <i>oreadensis</i> .....	" 50.
"	"	— <i>brachyptoma</i> .....	" 45-47.
"	"	— <i>cambricus</i> .....	" 33-52.

Dr. Günther. Non-migratory forms.	<i>Salmo levenensis</i> .....	"	49-90.
"	— <i>fario</i> , var. <i>gaimardi</i> .....	"	33-46.
"	— var. <i>ausonii</i> .....	"	38-47.
"	— <i>ferox</i> .....	"	43-49.
"	— <i>stomachicus</i> .....	"	44.
"	— <i>gallivensis</i> .....	"	44.
"	— <i>nigripinnis</i> .....	"	36-42.
Mr. Day. Non-migratory forms.	<i>Salmo fario</i> :—		
	Gloucestershire .....	Cæc. appen.	34-39.
	Cornwall & Cardiganshire .....	"	35-44.
	Yorkshire .....	"	35.
	Sutherlandshire .....	"	46.
"	<i>Salmo levenensis</i> :—		
"	At Howietoun .....	"	47.
"	4 <i>S. salar</i> & <i>S. levenensis</i> .....	"	{ 61, 62,
"	Migratory form .....	2 <i>S. salar</i> , Devonshire ...	{ 69, 78,
"			61, 71.
Mr. Arthur. Non-migratory form	<i>Salmo fario</i> , var. <i>ausonii</i> , .....	"	43-54.
	New Zealand.		

I do not propose referring to the foregoing, as I have elsewhere (British and Irish Fishes) entered on a consideration of how the Brook-Trout, transported to a warmer climate, and where food is abundant, has taken on a structural change, conclusively showing that the number of cæca is not invariable, but changes with changing circumstances, and consequently cannot be a criterion of species; for all the eggs of the Brook-Trout sent to Tasmania were from districts considered by Dr. Günther to be inhabited by the race *ausonii* of *Salmo fario*, in which he had found from 38 to 47 cæcal appendages only: the same result of change being likewise shown in the transference of Lochleven Trout to Howietoun.

I do not propose arguing upon the foregoing premises, but they may tend to prove that in undoubted hybrids the percentage hatched is comparatively small, that the number of malformations is great, and the young appear to be sickly. On the other hand, it does not seem unreasonable to almost doubt whether there exists specific difference between the American and British Charrs, monstrosities being rare, and the young strong. The sole male Charr employed had been some time ready for spawning before being used, and doubts were expressed at the condition of the milt. After one or two years' more enquiry, a trustworthy answer may be given; but so far as hybrids from Howietoun have gone, sterility appears to be the rule, as yet no exceptions having been noticed, but the examples have been few.

Much stress has been laid upon the number of finger-marks or transverse bars along the sides of various forms of Salmonidæ, as characteristic of species. Thus in the second edition of the Parr Controversy (1883) we are told (p. 126) that in the Salmon there are nine or ten, but in the Trout only six or seven; while those of the Charr are not alluded to. Dr. Günther, in his 'Introduction to the Study of Fish,' repeats the popular idea when he observes, "The number of bars is not quite constant, but the migratory Trout have 2 (and even 3) more than the River-Trout" (p. 631).

Although it appears pretty evident that the number of these parr-bands may slightly vary with the age of the fish, and that they may be broken up in some forms, it is still clear that very great latitude must exist, as we find them occasionally of different numbers on the two sides of the same fish. I will now give the figures showing the bands as existing in the specimens to which I have referred, and most of which are now on the table.

Three Salmon smolts, hatched March 1881, had, when captured on November 29th, ten finger-marks on either side.

Two Salmon smolts, from the Hodder, each about seven inches long, had nine or ten finger-marks on each side.

Twenty-two Salmon-fry, the eggs of which came from Canada, gave the following results:—

Eight specimens at 3 months of age: the bars averaged  $8\frac{7}{8}$  on each side of the fish, eight was the smallest number, ten the largest; and the greatest difference in number between the two sides of one fish consisted in eight on one side and ten on the other.

Five specimens at 4 months of age: the bars averaged eight, while seven was the smallest and nine the largest number; in one fish there were nine on one side and eight on the other.

Four specimens at 5 months of age: the bars averaged  $8\frac{1}{2}$ , while seven was the smallest and nine the largest number; the difference between the numbers of bars on the two sides of any fish did not exceed one.

Five specimens  $5\frac{1}{2}$  months of age: the bars averaged  $8\frac{4}{5}$  while seven was the smallest and ten the largest number; the difference between the numbers of bars on the two sides of any fish did not exceed one.

The general average of bars in these twenty-two specimens was  $8\frac{1}{2}$ , and only twelve out of the twenty-two had so many as nine or ten bars, while in one specimen they did not exceed seven; the same number being on one side of three others. All the examples of young Salmon had from seven to ten finger-marks along the sides.

Among the hybrids between the Salmon and the Lochleven Trout, on November 15th, 1881, three specimens at 8 months of age had from ten to thirteen finger-marks along the sides. Three of the same batch were captured November 29th, 1883, at 20 months of age: one had twelve bars on both sides, one ten on one side and twelve on the other, and the remaining fish ten on one side and eleven on the other, showing a variation of from ten to twelve bars.

Among four hybrids between Lochleven Trout and American Charr, captured November 29th, 1883, at 5 months of age, the average number of bars was  $9\frac{1}{4}$ , the least number being eight, the most eleven, and the greatest difference between the two sides of one fish being two. This shows a higher number of bars than were seen in the young of the true Salmon at Howietoun at the same age, or at the Fisheries; while only Trout and Charr blood were mixed. As the fish got older these bars broke up and could not be counted.

Among three hybrids between the American Charr and the Lochleven Trout, captured November 29th, 1883, at 5 months of age,

the average number of bars was  $9\frac{1}{2}$ ; the least number being eight, the most eleven, and the greatest difference between the two sides of one fish being two.

Among eight pure Lochleven Trout at 9 months of age, captured November 29th, 1883, the average number of bars was  $12\frac{1}{2}$ ; the smallest number being eleven and the largest fourteen, the greatest difference between the two sides of one fish being two. These figures are remarkable as showing that at Howietoun the average number of bars in the Lochleven Trout exceeds that observed in the young Salmon.

Among four young American Charr, captured November 29th, 1883, the average number of bars was eight, the smallest being seven and the largest ten, the greatest difference between the two sides of one fish being one.

Among four hybrids, or rather crosses, between the American and Scotch Charr, captured July 20th, 1883, when they were five months old, the average number of bars was  $9\frac{1}{2}$ , the smallest being eight, and the largest eleven, the greatest difference between the two sides of one fish being two.

Among two more hybrids of the same lot as the last, but captured on November 29th, 1883, at nine months of age, the average number of bars was  $11\frac{1}{2}$ , the smallest being eleven, and the largest thirteen, the greatest difference between the two sides of one fish being two. In this case it appears as if the number of bars has been augmented with age.

So far as the evidence of the foregoing specimens bears upon the question of the number of parr-bands along the sides of young Salmonidæ, they may be summed up as follows:—

	Average.	Largest number.	Smallest number.	Greatest difference.
3 <i>Salmo salar</i> , at Howietoun.....	10	10	10	0
3 " " from the Hodder ...	$9\frac{3}{4}$	10	9	1
22 " " from Canada.....	$8\frac{1}{4}$	10	7	2
3 Hybrid <i>S. salar</i> and <i>S. levenensis</i> .	$11\frac{1}{2}$	12	10	2
4 " " " " " "	$11\frac{1}{2}$	12	10	2
4 Hybrid <i>S. "levenensis</i> ♀, <i>S. "fontinalis</i> ♂ .....	$9\frac{1}{2}$	11	8	2
3 Hybrid <i>S. fontinalis</i> ♀, <i>S. levenensis</i> ♂ .....	$9\frac{1}{2}$	11	8	2
8 <i>Salmo levenensis</i> .....	$12\frac{1}{4}$	14	11	2
4 <i>Salmo fontinalis</i> .....	8	10	7	1
4 Hybrid <i>S. fontinalis</i> ♀, <i>S. alpinus</i> ♂ .....	$9\frac{1}{2}$	11	8	2
2 Hybrid <i>S. fontinalis</i> ♀, <i>S. alpinus</i> ♂ .....	$11\frac{1}{4}$	13	11	2

It appears to be a fallacy that the Salmon or migratory Salmonidæ have more parr-bands than forms of non-migratory Trout—those of the Lochleven Trout at Howietoun, provided the foregoing averages are accurate, showing the greatest number of these marks; while the Canadian *S. salar* gives an extraordinarily small average, only equalling the American Charr.

It is difficult to make out the number of bars along the sides in

Shaw's woodcuts; but it appears from Yarrell's work, 'On the Growth of the Salmon in Fresh Water,' that the numbers are as follows:—

Shaw	found at 1·0 inch in length	9 bands.
"	" 1·2	" " 13 or 14 bands
"	" 2·9	" " 16 bands
Yarrell	" 3·5	" " 9 "
"	" 4·3	" " 11 "
"	" 6·1	" " 10 "
"	" 6·3	" " 11 "

But without descriptions it is not safe to go by figures respecting the modes of colouring.

American Charr or Brook-Trout, *Salmo fontinalis*. About 8000 fry were turned into a large wooden box, which measured 20 × 18 feet. These fish were hatched in January 1883, and the water in which they have lived has remained at an average of about 44°. This species does well in a wooden tank indoors for a year, in which respect it differs from the other Salmonidæ. But out of doors it seems to be rather delicate, and the older females, unless spawned as soon as ready, are very subject to fungus, and die egg-bound; the males likewise are very often victims to this disease.

November 29th, 1883, these young fish in the tank appeared to be very healthy; four were removed for examination, and are now on the table.

	inches.	Bars.	Bars.
No. 1. Length of fish	3·5	10	10
No. 2. " "	3·5	8	9
No. 3. " "	3·5	7	7
No. 4. " "	2·1	7	7
Average . . .	3·1	8	8

It would appear that, judging from these few examples, the smaller fish have the least number of bars; but there are many intermediate half bars which only descend to the lateral line or a little below it. All of them had a few fine teeth on the head of the vomer, but none on the body of that bone.

On November 15th, 1882, Sir James Maitland obtained 9000 ova from the American Charr, which were fertilized by the milt of a Charr obtained from Loch Rannoch, and which had been retained in one of the boxes. There was a little doubt expressed at the time respecting the milt, which was rather thick. The eggs were placed in box No. 116, and on November 29th, 1883, about 65 were alive, all being well-grown fish. The mortality among the 9000 ova was as follows:—November 28, December 309, January 1907, February 130, or a total loss of 2104. Probably this mortality may have been due to deficiency of fertilization. The young showed no amount of monstrosities or malformations, and have done well.

On May 20th I received one, 1½ inch long, having 8 broad cross bands and many small intermediate ones; no band on the dorsal fin.

On July 20th, 1883, I removed the following four from box No. 116:—

	inches.	Bars.	Bars.
No. 1. Length of fish	2·1	9	11
No. 2.     "     "	2·0	8	9
No. 3.     "     "	1·8	9	11
No. 4.     "     "	1·3	10	9
Average....	1·8	9	10

In some of these specimens the cross bars were much more broken up on one side of a fish than they were on the opposite; one had 9 wide ones, another had 6 to opposite end of dorsal fin, after which they were broken up. All had the light anterior edge to the first dorsal fin. None were deformed.

On November 29th, 1883, the following two fish were taken from the tank:—

	No. 1.	No. 2.
Length of fish.....	3·0 inches.	2·8 inches.
" head .....	0·6     "	0·6     "
" caudal fin ..	0·5     "	0·45     "
Height of body .....	0·5     "	0·5     "

Specimen No. 1. D. 14 ( $\frac{4}{10}$ ). P. 14. V. 9. A. 11 ( $\frac{3}{8}$ ). C. 19. L. 1. 136.

*Colours.* This fish had about 13 bars or finger-marks along one side and 11 along the other, but somewhat irregularly placed, most extending to below the lateral line, while they were of varying widths, with generally an intermediate row above and another below. Numerous light spots over the body and head running into irregular bands and rings, especially near the back. Dorsal fin darkest in its lowest half, and with some light spots, the other fins unspotted. The maxilla reaches to beneath the posterior third of the eye. 28 rows of scales between the adipose dorsal fin and the lateral line.

Specimen No. 2. D. 13 ( $\frac{4}{10}$ ). P. 14. V. 8. A. 11 ( $\frac{3}{8}$ ). C. 19. L. 1. 124.

*Colours.* This fish had from 11 to 12 bars or finger-marks along either side of the body, but they were much shorter and more irregular in shape and size than in the last, while below the lateral line it had fewer and smaller intermediate blotches. The marks also along the back were more irregular. Teeth along the head of the vomer, none along the body of the bone. 20 rows of scales between the adipose dorsal fin and the lateral line.

The following formula I have found existing in some specimens of Scotch and American Charr:—

	Dorsal fin.	L. 1.	Rows from adipose dorsal to lateral line.
Scotch....	D. 12-14.	125-145.	18-28.
American..	D. 12-13.	122-140.	21-26.
Hybrids ..	D. 13-14.	124-136.	20-28.

Considering that these fishes have shown no tendency to monstrosities, have been well formed, and grown fairly in proportion to the young of the true American Charr hatched at the same time, I cannot resist thinking that it may be possible that these two fish, although so widely differing in colour, may be merely varieties of one species, descendants from one common stock. This question, however, will be more appropriately discussed when we possess fish a year or two older.

On November 29th, 1883, about 4500 eggs were obtained from a Lochleven trout which had been hatched in 1875, and these were milted from a young Salmon, such as I have already described, which was taken for this purpose from pond C. 130. These eggs were deposited in box 88.

About 3000 eggs were taken from a Lochleven Trout of the season of 1875, and fertilized from the milt of two American Charr. These eggs were deposited in box 92.

About 2695 eggs were taken from an American Charr and milted from a young Salmon from pond C. 130. These ova were deposited in box 96.

About 1000 eggs were obtained from a Brook-Trout of about 1lb. weight and fertilized from the milt of the dead young salmon already referred to. These eggs were deposited in box 100.

5. On the Generic Position and Relations of *Echinanthus tumidus*, Woods. By F. JEFFREY BELL, M.A., Sec. R.M.S., Professor of Comparative Anatomy in King's College.

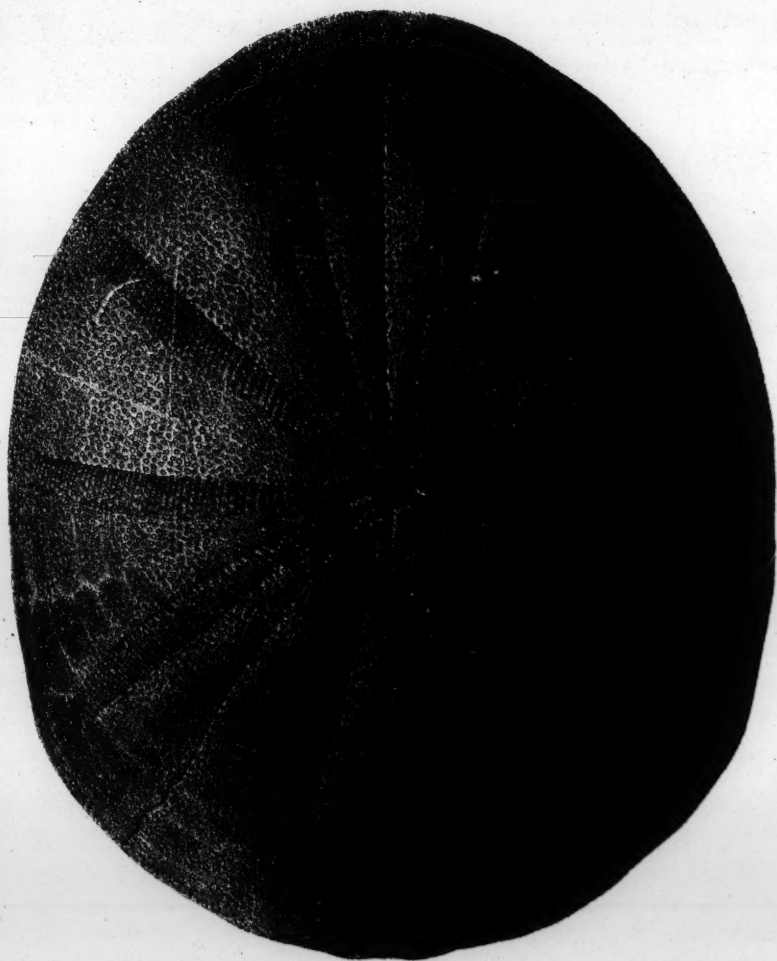
[Received December 18, 1883.]

(Plates II. & III.)

For some years past our knowledge of the Echinoidea has been increased by the descriptions of various new species, published by the Rev. J. E. T. Woods, which have appeared in the 'Proceedings' of that excellent body the Linnean Society of New South Wales.

Of such forms the most remarkable was that which was distinguished by him as *Echinanthus tumidus*<sup>1</sup>; my knowledge of this species was confined to the short description which he gives of it, but that description was sufficient to rouse my curiosity. It was, therefore, with the greatest pleasure that I found an example of it among a set of specimens which Mr. E. P. Ramsay lately submitted to me for determination. The original diagnosis had made it clear to my mind that the species did not belong to the genus *Echinanthus*; and an investigation of the characters of the specimen itself lead me to the belief that it presents very important points of difference from any form yet described.

<sup>1</sup> Proc. Linn. Soc. N. S. W. ii. p. 169.



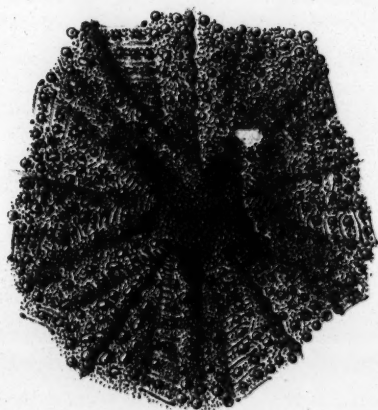
AH Searle del et lith.

Hanhart imp.

ANOMALANTHUS TUMIDUS.



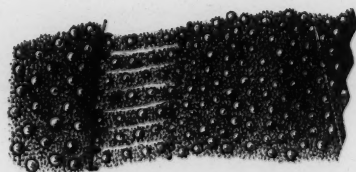
2



1



3



After Neale del. x. 11.

Hanhart imp

ANOMALANTHUS TUMIDUS



In this last statement I feel able to include the fossil forms, in a review of which I was very greatly aided by the wide knowledge and kind courtesy of Mr. Etheridge, F.R.S.

I proceed first to give a detailed account of the specimen in my hands, in connexion with which the careful figures may be suitably studied.

*Description of the Specimen.*—Test high, swollen, longer than broad, flattened in the neighbourhood of the apical area, sloping gradually at the sides, but sloping rather more sharply anteriorly than posteriorly; apical area a little anterior to the true centre of the test; anus exactly marginal, looking backwards and downwards, and set almost exactly at an angle of  $45^\circ$  to the actinal surface of the test. The actinostome deeply sunken, the five interambulacral sutures only faint grooves.

The poriferous zones very remarkable, being wider where they terminate than at any other point along their course, and with a faint tendency to be lyre-shaped. The pores vary very much in size; in the anterior (odd) ambulacrum the pores of the outer series are easily seen only in the last fourth of the row, and here they are large; one row, that to the left of the specimen, has, however, only one eighth of its course provided with large pores; in the inner rows the pores are smaller than the large pores of the outer rows, and a larger number are subequal, the largest are at the distal end; in the left inner row there are a few scattered large pores near the proximal end. In the right anterolateral ambulacrum there are no pores as large as some of those in the anterior; most of those in the two outer rows are quite small, and in the inner some, though not so many as in the anterior ambulacrum, are of fair size and subequal. In the left anterolateral ambulacrum the outer rows have a few scattered pores large enough to be seen without the aid of a magnifying glass, near the apex; in the inner rows the number of fair-sized subequal pores is hardly less than in the anterior ambulacrum. The outer rows of the right postero-lateral ambulacrum repeat very much the characters of those in the anterior ambulacrum, and in the inner rows there are a large number of fair-sized subequal pores. In the left postero-lateral the pores are still better developed, and nearly both members of every pair are quite distinctly seen; as in the preceding the larger pairs are in the outer rows.

This predominance in the size of the pores of the outer row is a very familiar phenomenon among the Clypeastridæ. The grooves which pass from pore to pore in every pair are shallow, and are almost as well indicated by the row of tubercles which alternate with them; these tubercles are of fair size, twice as large as in *Echinanthus testudinarius*, and there are, as a rule, five in each row; they are arranged in very regular parallel rows.

Distally to the paired pores a pair, or two or three scattered pores are to be observed, in the left half of the anterior ambulacrum, both halves of the right antero-lateral and postero-lateral ambulacra, the two halves of the left postero-lateral, and the anterior half of the left antero-lateral ambulacrum. There is nothing, however, in the

disposition of these odd pores to call to mind the characters of an *Echinolampas*.

The madreporite occupies the centre of the apical area, and the five genital pores are quite distinct; the two smallest are those that lie to the left, and the anterior one on the right is a little smaller than the other two; between these last lies an ocular pore almost as large as they; all the other ocular pores are quite small.

The sutures between the coronal plates are, on the abactinal surface, remarkably distinct; the tubercles are all of moderate size, subequal, and minutely perforated at their tip; they are not closely packed, and the intervals between them are occupied by miliaries rather coarser than those of *E. testudinarius*.

The tubercles on the actinal surface are a little larger and rather more closely packed; they are more deeply sunken, and the miliaries are rather coarse.

Mouth deeply sunken. Owing to its injured condition it is impossible to say how much or how little has been removed, and I cannot follow Mr. Tenison-Woods in giving an exact statement as to its size or shape.

The pillars within seem, so far as one can judge by the touch, to be well developed, and are to be felt just within the margin of the injured mouth; so that they extend over at least three fourths of the radius of the internal cavity.

During life the test would seem to have been covered with primary and secondary spines, both of which were short, and the former about twice as stout as the latter; they were coarsely striated, had a strongish ring, and were probably of a yellowish-green colour.

The dried test is brown, but the colour is not uniform, being darker at the ambitus than in the enclosed region; the colour below more uniformly brownish.

Length 140, breadth 116, longest axis of anus 8 mm.

*Hab.* —. Mr. Tenison-Woods states that he has "every reason to think (it) came from the coast of N. S. Wales, though there is no precise information as to its habitat." The injuries received by the specimen indicate that it was speared by the pronged instruments with which flat fish are fished for in Port Jackson and its neighbourhood.

*Theoretical Considerations.*—It will be clear enough that the generic definition of *Echinanthus* will have to be very considerably altered, if we allow the species now described to remain within its limits.

Hardly any character is of greater importance among the Echinoidea in general than that of the disposition of the pores in the ambulacral plates; among the Petalosticha this character rises to be one of supreme importance, and is, I believe, the best criterion of the extent and intimacy of generic relations.

In forms already known to us we find that the pores may be set in straight parallel rows which, at the region of the ambitus, become more or less irregular and scattered, *e. g.* *Palæolampas crassa*; or the pores of one half may be less numerous than those of the other, *e. g.*

*Echinolampas depressa*. Yet, again, the pores may become completely confined to the abactinal side of the test, as in *Clypeaster* or *Echinanthus*; but, when this happens, there is a marked tendency, in all known genera, for the distal pores to approach, and the median pores to separate from their fellows of the corresponding pair; to produce, in fact, a petal-like arrangement of the poriferous zones. It is clear that, in the history of development, there must be a time when the pores are open<sup>1</sup>, and more or less regularly arranged in parallel rows, and it is no less clear that at no time would there be, of necessity, any tendency to a spreading or widening out of the poriferous zones, in the mode here compared to that of a lyre; nor is this more than indicated in the form now before us; but the tendency is distinct enough to remove the species from the direct line of ancestry through which the *orthostichous* passed to the *petalostichous* Echinid.

It is necessary therefore to distinguish the generic position of the form, and I propose to call it *Anomalanthus*, and to define it in the following terms:—

A petalostichous Echinid in which the ambulacral pores are arranged in rows which are not closed or quite parallel, but which tend to spread out after a lyre-shaped fashion at their distal end. The actinal surface is free of pores and has the ambulacral sutures of *Echinanthus*, which are not, however, converted into conspicuous grooves. Mouth deeply sunken. Anus a little elongated transversely, placed exactly at the ambitus. Five genital pores, not all of the same size; one ocular pore very large. Primary tubercles perforate, regularly distributed over the whole test. Its nearest allies are *Echinanthus* and *Clypeaster*.

The fact that the outer rows of pores are ordinarily larger than those of the inner allies this genus to *Clypeaster* and *Echinanthus*, while the great irregularity in the size of the pores shows that the whole system is in a fluid or plastic condition. The fact that, as yet, only one specimen is known, indicates that the form is rare; indeed in all possibility it is dying out. Like other members of the terrestrial and marine fauna of Australia, we have indications of long continued existence as a distinct species, coupled with an incapacity to live in large numbers in the presence of organisms more plastic and more easily adaptable and adapted to the conditions of their present environment.

The enthusiasm of the naturalists of Australia will, no doubt, continue to bring to light forms such as this, which, by indicating some of the conditions and causes of failure, will throw an oblique light on the mechanical conditions of success, and enable us to add to laborious and detailed descriptions of specimens some reasonable suggestions as to their relationships and history; to convert, in fine, a science of observation into a philosophical inquiry into the causes of things.

<sup>1</sup> In the 'Revision of the Echini' (pl. xiii. figs. 16-18) there are figures of young *Clypeasters* with the petals still open and the actinal grooves developed.

## EXPLANATION OF PLATES II. &amp; III.

## PLATE II.

Fig. 1. *Anomalanthus tumidus*: nat. size.

## PLATE III.

Fig. 1. *A. tumidus*, profile view ( $\frac{3}{4}$  nat. size).

Fig. 2. Apical area, and upper coronal plates ( $\times 2$ ).

Fig. 3. Portions of a poriferous zone and adjoining plates, to show the character of the tubercles and miliaries.

---

February 5, 1884.

Professor Flower, LL.D., F.R.S., President, in the Chair.

Prof. Flower made some remarks on the principal points of interest exhibited by the Burmese Elephant, deposited in the Society's Gardens by Messrs. Barnum, Bailey, and Hutchinson.

Mr. F. Day, F.Z.S., exhibited a specimen of a Dog-fish (*Acanthias vulgaris*), and made the following remarks:—

"The specimen exhibited is that of a female Dog-fish (*Acanthias vulgaris*) 27 inches in length, consisting merely of the skin (including even that covering the eyes) and skeleton, out of which I have removed about 20 examples of the elongated Isopod *Conilera cylindracea*, some of which measured as much as  $1\frac{1}{2}$  inch in extent. The spiracles, vent, and an orifice behind each pectoral fin appeared as if they had been enlarged or made by these parasites, which had devoured the whole of the soft parts of the fish. The history of these fish-parasites as known at Mevaggissey I gave at a meeting of the Society in 1879; I will therefore merely observe how this fish was captured.

"On January 30 I received a box of fish from Mr. Dunn, of Mevaggissey, and he remarked that he had sent, among other things, Dog-fish, or, rather, the skin of one, as the entrails of the creature had been entirely eaten out by the lice. The fish he had personally captured in a mullet-net which he had set half a mile from land on sandy ground to secure Dog-fishes. Of these he had taken 100 at one time; but nearly every fish was found to have been eaten in a like manner by the lice.

"Subsequently Mr. Dunn advised me that these lice (*Conilera cylindracea*) in the summer months are found from 15 to 20 miles from land, generally on soft and sandy bottoms. When the fishermen in foggy weather get on this bottom, they call it "lousy ground." When the lice are abundant they drive away the Congers and other fish. Often a shoal of Bream will come and eat them up. As these parasites devour fish in a few hours it seems hardly possible with their habits to class them as fixed; they would seem to pertain to those which are free, as they hunt in large shoals, and must be constantly moving from place to place in search of food."

---





$\frac{1}{10}$

J. Smit del et lith.

Hartnert imp.

STREPSICEROS IMBERBIS.

Mr. Henry Seebohm, F.Z.S., exhibited a skin of the American Kestrel (*Falco sparverius*), which had been shot by Thomas Hague, a gamekeeper, in the neighbourhood of Helmsley in North-east Yorkshire last May. Two birds were together, and were both dropped by the gamekeeper by a right and left shot; but he was only able to mark one of them down. The bird found was taken in the flesh to Mr. Christopher Smith, who was unable to identify it, and sold afterwards to Mr. Robert Taylor of Harome, who preserved it. It proved to be a female. Mr. Taylor, not knowing its rarity, parted with it in exchange to Mr. C. Helstrip, a birdstuffer in York. He offered it to Mr. James Backhouse, jun., of that city, as a Lesser Kestrel, of whose collection it now forms a part. Mr. Backhouse has taken considerable trouble to satisfy himself of the bona fides of all concerned, and there is nothing in the appearance of the skin to lead to the supposition that the bird had been kept in a cage.

The American Kestrel breeds throughout North America south of lat. 62°, and is found in a more or less modified form in most parts of South America. South of Virginia this bird is said to be a resident, but there is no doubt that it is migratory in the northern portion of its range. It was not known that this species had ever visited Europe before.

Unfortunately the name of a brother of Mr. Taylor, who is now dead, had been connected with an alleged occurrence of the Swallow-tailed Kite in the same district in 1859, but there did not seem to be any reason why a possible attempt at fraud in one case should affect the authenticity of the other.

Mr. G. F. Butt, F.Z.S., sent for exhibition two examples of a variety of the Red Grouse (*Lagopus scoticus*), shot in September 1883 on the Appleby Moors in Westmoreland, and stated to be out of a brood of ten birds. They were remarkable for their pale plumage, which was nearly white, mottled with brown.

The following papers were read :—

1. On the Lesser Koodoo, *Strepsiceros imberbis* of Blyth.  
By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 30, 1884.]

(Plate IV.)

When I was inspecting the fine collection of living animals at the Chateau Beaujardin, Tours, in October last, my friend M. J. M. Cornély called my attention to a young pair of Antelopes, which he had then lately received, and asked my assistance in determining their species. I could only tell him that they appeared to belong

to the Lesser Koodoo of Blyth, of the existence of which in Somaliland (whence the specimens in question had been obtained) I had heard from Sir John Kirk and other authorities, although I had never seen a living example of the species, and was not quite certain of its validity. The male of this pair of Antelopes having died shortly afterwards, its body was kindly sent to me entire by M. Cornély; and I have now the pleasure of exhibiting to the meeting a mounted specimen of this rare and beautiful Antelope (see Plate IV.), concerning which I propose to offer a few remarks.

The Lesser Koodoo was first discriminated as a species by Blyth in a paper read before this Society in January 1869<sup>1</sup>. Blyth pointed out that the Lesser Koodoo differed from the larger and better known form (*Strepsiceros kudu*) in its smaller size, in the absence of the fringe of long hair down the neck in front, and in the much more compressed spiral of the curvature of the horns. From the second of these characteristics, he proposed to call the species *Strepsiceros imberbis*.

Besides the specimen of the young male Lesser Koodoo, already referred to, I have borrowed for exhibition to-night a fine head and pair of horns of an adult male of the same animal, and a pair of horns of a rather younger individual; the former kindly lent to me by Mr. E. Gerrard, jun., by whom they were received from Sir John Kirk, and the latter belonging to M. Cornély, who obtained them along with his pair of living animals<sup>2</sup>. It will be observed that these specimens, so far as they go, fully support Blyth's views as to the specific distinctness of the Lesser Koodoo.

Looking to the front view of the two skulls with the horns attached now before us, the great difference in size and in the shape and form of the expanse of the spiral is at once manifest. The following are the comparative measurements of these two specimens in inches and tenths:—

	<i>Str. kudu.</i> inches.	<i>Str. imberbis.</i> inches.
Length of horns from base to tip in a straight line . . . . .	35·0	18·5
Distance between tips of ditto. . . . .	37·0	9·0
Length of skull from occipital condyle to end of upper jaw . . . . .	15·0	12·5
Breadth of ditto across forehead . . . .	6·5	4·75

It will also be observed that, as has been well pointed out by Mr. Blyth, the spiral formed by the horns in *S. imberbis* has a much smaller axis. In *S. kudu* the spiral is very open, almost as in some specimens of the Markhore Goat (*Capra megaceros*).

I will now make a few remarks on some of the synonyms that have been assigned to this species.

<sup>1</sup> "Notice of two overlooked Species of Antelope," P. Z. S. 1869, p. 51.

<sup>2</sup> This pair of living animals and the horns were originally imported by Mr. C. Hagenbeck of Hamburg, along with other animals from Somali-land.

Fig. 1.

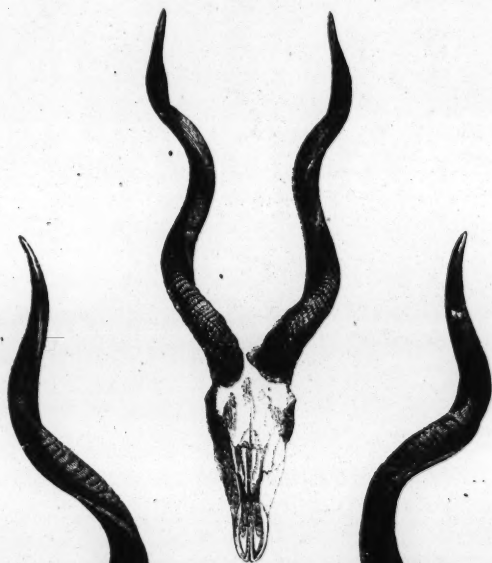


Fig. 2.

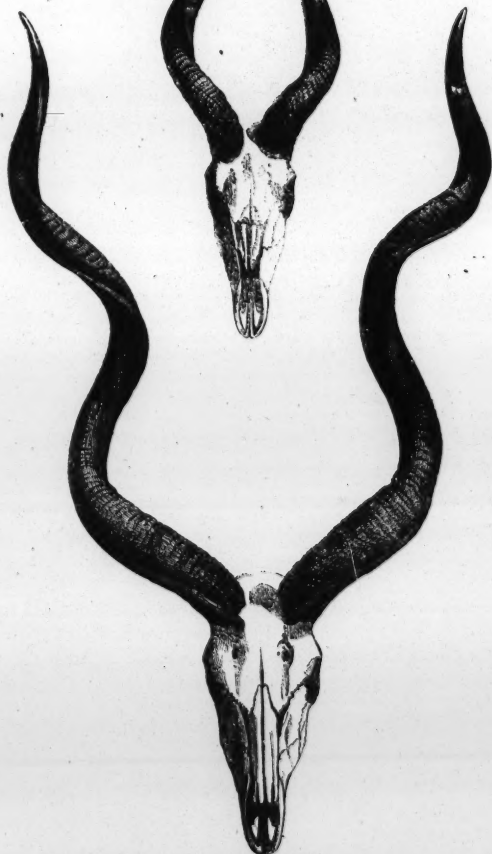


Fig. 1. Head and horns of *Strepsiceros kudu* (front view).  
Fig. 2. Head and horns of *Strepsiceros imberbis* (front view).

## STREPSICEROS IMBERBIS. (Plate IV.)

*Antelope tendal*, Cretzschmar, in Rüpp. Atl. p. 22, 1826 (?).

*Damalis capensis*, Smith, Ill. Zool. S. Afr. pl. xlii. (?).

*Strepsiceros kudu*, Horsf. Cat. Mamm. Mus. E. I. Co. p. 170 (part.).

*Strepsiceros kudu*, var. 1, Gray, Cat. Mamm. iii. p. 134 (1852).

*Strepsiceros imberbis*, Blyth, P. Z. S. 1869, p. 54 et p. 58; Brooke, P. Z. S. 1875, p. 470.

*Strepsiceros tendal*, Gray, Cat. of Rum. B. M. p. 46 (1872).

*Similis S. kudu*, sed *crassitie valde minore et maris cervice imberbi distinguendus*.

*Hab.* Somali-land.

Dr. Gray in his most recent catalogues has used the specific name "*tendal*" for this Antelope, under the supposition that it may be the *Antelope tendal* very shortly mentioned by Cretzschmar in a footnote in Rüppell's Atlas. Cretzschmar's description is based only on native reports of an Antelope called "*Tendal*," which is more probably the larger Koodoo. At any rate it would not be right to oust Blyth's name in favour of one so imperfectly characterized.

I think there is little doubt that the specimen brought by Sir W. C. Harris from Shoa, Southern Abyssinia, and formerly in the East-India Company's Museum, belongs to the smaller Koodoo. It is now in the National Collection, where I have examined it. It is in a very bad condition, the hair and markings of the body having almost entirely disappeared. It is a stuffed specimen, and stands about 45 inches in height. The length of the body is about 40 inches, that of the horns 18, of the ears 7 inches.

Whether "*Damalis capensis*," as represented on plate 42 of Smith's 'Illustrations,' really belongs to *S. imberbis*, as supposed by Blyth, is, I think, very doubtful. It is true the neck has no fringe, but the horns have the open spiral of *Str. kudu*, and, so far as we know at present, *Str. imberbis* is only met with for certain in Somali-land.

P.S. (March 28).—Since I read this paper Mr. F. Holmwood, H.B.M. Consul, Zanzibar, has kindly favoured me with the following note on this Antelope:—

"I have seen the Dwarf Koodoo in the neighbourhood of the Juba river, which is exactly under the Equator. I have heard from the natives that the "*Sikoro*," as they call it, is found from about 2° N. to 2° S. of the coast; but as at 60° S. the ordinary Koodoo is "*Msikoro*," it is not safe to trust to native information. The Dwarf Koodoos that I saw on two occasions were in herds of three and four individuals respectively; but in neither case was I near enough to observe more than that the animals were of about the same size as the Beisa (*Gryx beisa*), but of a redder colour. The species is not rare on the Juba, but the country is dangerous for Europeans.

## 2. On some Species of Chiroptera from Australia.

By W. LECHE, University of Stockholm.

[Received December 17, 1883.]

Through Mr. G. Schneider, of Basel, I have received a collection of Australian Bats in alcohol, on some of which I beg leave to offer a few remarks.

1. *NYCTINOMUS PETERSI*, sp. nov.

Of hitherto described species this stands nearest to *N. norfolcensis*, Gray. It differs from it slightly, however, through the following characteristics:—(1) Gular sac entirely wanting in both the male and female, while it exists in *N. norfolcensis*. (2) Nostrils opening forward; in *N. norfolcensis* sublaterally. (3) The wing-membrane is attached to the tibia a short distance from the ankle; in *N. norfolcensis* it issues from the ankle. (4) The innerside of the first lower premolar is not covered by the cingulum of the second pre-

Fig. 1.

*Nyctinomus petersi*, ♀.

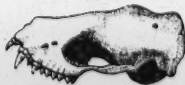
*a*, skull, twice the natural size; *b*, lower dentition in front, natural size.

molar as in *N. norfolcensis*. (5) It has only four deeply bifid incisors in the lower jaw, while *N. norfolcensis* is said to have in addition a third outer pair of very small lower incisors; but perhaps this difference is only individual, or dependent upon age.

The tragus, antitragus, the relative length of the metacarpal bones, and other important characteristics agree completely with those of *Nyct. norfolcensis*.

The cranium is distinguishable, in comparison with that of *Nyct. brasiliensis*, by its sharply depressed flattened form as well as by

Fig. 2.

Skull of *N. brasiliensis*, ♂, twice the natural size.

the fact that the upper profile-contour is entirely straight. The *crista occipitalis* forms the highest point of the cranium; in *Nyct. brasiliensis* the crown of the head rises higher. The ventral edge of the upper jaw is almost straight, while in *Nyct. brasiliensis* it is strongly turned upward in front.

The first lower premolar is as high as the cingulum of the second.

Measurements (female).

	millim.
Length, head and body .....	57
„ head .....	21
„ tail .....	33
„ tail, free from membrane	12
„ ear, outer margin ....	16
„ tragus .....	3
„ forearm .....	34
„ third finger, metacarpal	36
„ fifth finger, metacarpal	24
„ tibia .....	10

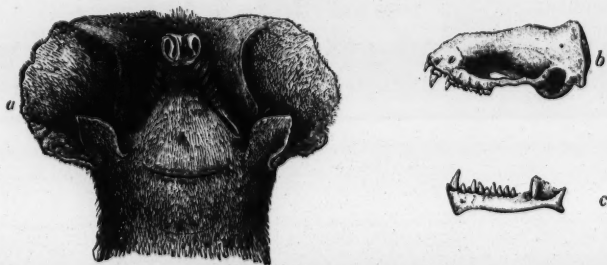
The male is considerably smaller.

*Hab.* South Australia.

2. *NYCTINOMUS ALBIDUS*, sp. nov.

This species is most nearly related to *Nyct. australis*, Gray, which has otherwise a rather isolated position in the genus. From the last-named form it deviates through the facts:—(1) that the ears are much longer than the head and united by a low band, whereas in *Nyct. australis* they are shorter than the head and separate; (2) the integument forming the ear-conch is thick and opaque, whereas in *Nyct. australis* it is rather thin; (3) in *Nyct. australis* a narrow band of hair extends outwards behind the forearm and covers the

Fig. 3.



*Nyctinomus albidus*; natural size.

space between it and the upper third of the fourth metacarpal; this covering of hair is lacking in *Nyct. albidus*; (4) concerning the adult male of *Nyct. australis*, Dobson (Catalogue of Chiroptera in British Museum, 1878, p. 433) states that "the fur covering the wing-membrane beneath, between the humerus and femur and the sides of the body outwards, is pure white, contrasting strongly with the dark-brown fur of the body," and furthermore that it is provided

with a very large gular sac, much larger than in any other known species of the genus; while, on the other hand, in the female of the same species, "the fur covering the wing-membrane along the sides of body beneath does not differ in colour from the fur covering the sides of the abdomen," also in the same, "the margin of the mouth of the gular sac is alone developed." Mr. Dobson correctly calls attention to these secondary sexual characters as peculiarly noticeable, as such differences between the male and female of insectivorous Bats are very rare. Of especial interest now is the fact, that the female of *Nyct. albidus*, in the respect just alluded to, corresponds precisely with the male of *Nyct. australis*, as both the white colour of the under-part of the wing-membrane and a large, particularly well developed gular sac appear. Here, also, the very singular fact meets us, that characteristics which in one species are exclusively distinctive of the one sex, are found in a nearly related species in the other. Unfortunately I have not had an opportunity of examining any male of *Nyct. albidus*; it is highly probable, however, that, at least with regard to the characteristics mentioned, no secondary sexual characteristics appear in this species.

Upper incisors long, with the points of the teeth strongly converging towards each other; the very small first upper premolar not filling the middle space between the canine and second premolar. The four lower incisors plainly bifid; first lower premolar about as high as the first molar, and not much lower than the second premolar.

*Hab.* South Australia.

Measurements (female).

	millim.
Length, head and body .....	85
„ head .....	30
„ tail .....	47
„ tail, free from membrane	28
„ ear, outer margin ....	26
„ tragus .....	5
„ forearm .....	60
„ third finger, metacarpal	58
„ fifth finger, metacarpal	32
„ tibia .....	30

3. *NYCTINOMUS FLICATUS*.

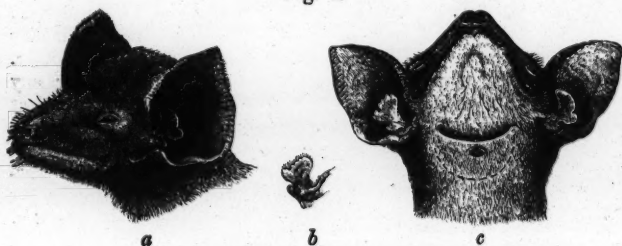
Several specimens completely corresponding with Dobson's description of this species (Catal. of Chiropt. p. 425), which has hitherto, according to Dobson, only been found in the peninsula of India, Sumatra, Java, Borneo, Malay peninsula, and the Philippine Islands, are in the collection, obtained from South Australia and Northern Tasmania.

4. *TAPHOZOUS AFFINIS*, Dobson, var. *INSIGNIS*, mihi.

Up to this time only one Australian species belonging to this genus

is known, viz. *T. australis*, Gould. Among the Australian Bats of the present collection there is, however, one specimen which does not show any near kinship with the above-mentioned species, while in all essential characteristics it so closely corresponds with Dobson's *Taph. affinis*, that it can only be taken as a geographical variety, which presents the differences indicated below. (1) The upper edge of the tragus is jagged, not quite circular, as in *Taph. affinis*, yet the ears are not entirely alike on both sides (compare figs. 4 *a*, *b*). (2) Behind the aperture of the well-developed gular sac, which is about 5 millim. deep, issues another small duplicature of integument,

Fig. 4.

*Taphozous affinis*, var. *insignis*.

*a*, Side view of head; *b*, right tragus; *c*, under view of head.

the aperture of which is provided with thickened edges. (3) The portion of the wing-membrane between the forearm and the third finger is white.

In other characteristics (ears, colour, distribution of fur, &c.) this specimen (which is a male) corresponds with *Taph. affinis*.

#### Measurements (male).

	millim.
Length, head and body . . . . .	74
„ head . . . . .	30
„ tail . . . . .	23
„ tail, free from membrane . . . . .	9
„ ear, outer margin . . . . .	25
„ tragus . . . . .	7
„ forearm . . . . .	70
„ third finger, metacarpal . . . . .	68
„ fifth finger, metacarpal . . . . .	41
„ tibia . . . . .	26

#### *Hab.* South Australia.

As *Taph. saccolæmus*, Temminck, only differs from Dobson's *Taph. affinis* through the colour of the ventral side and through the presence of a gular sac in the female, and as, again, *Taph. affinis*, var. *insignis*, likewise only differs in subordinate characteristics from

*Taph. affinis*, Dobs., thus these three forms could be regarded as direct descendants of the same type, which through geographical separation have perhaps gained a certain permanence. The geographical range of the three above-named forms seems only partly coincident. *Taph. affinis*, var. *insignis*, is the most easterly, *Taph. saccolæmus* the most westerly, and between them comes the *Taph. affinis*, having been up to this time only found in Labuan and Sumatra.

##### 5. MINIOPTERUS SCHREIBERSI, Natt., var. BLEPOTIS.

The three specimens examined by me correspond most closely with the description given by Tomes (Proc. Zool. Soc. 1858, pp. 121-123) of his *M. blepotis*.

Through the below-stated characteristics the animal in question differs slightly from the other forms of *Miniopterus*. (1) Interfemoral membrane nearly naked, only at its base on the dorsal side thinly covered with hairs. (2) The nose longer than in European specimens of *M. schreibersi*. (3) Above the base of the outer margin of tragus is a little round, triangular projection. (4) Length of the first upper premolar constitutes half in the form now described, in the European *M. schreibersi* less than half of the length of the second premolar.

##### Measurements (female).

	millim.
Length, head and body . . . . .	74
„ head . . . . .	17
„ tail . . . . .	54
„ forearm . . . . .	45
„ tibia . . . . .	19

From the above it is evident that the specimens in question differ from the European *M. schreibersi*, partly through the smaller size, partly through the characteristics above cited (2, 3, 4). Through the peculiarities mentioned under 3, they, on the other hand, approach *N. tristis*. The only difference between *M. australis* and the specimens indicated is described under 1; according to Dobson (*l. c.* p. 348), in *M. australis* half the interfemoral membrane is clothed.

From the above it ought thus with certainty to be deduced, that *M. schreibersi* and *M. australis* are united through intermediate forms, which (provided one can judge from Tomes's description, without having seen his original specimens) most nearly correspond with *M. blepotis*, Tomes. But as Dobson has joined the latter with *M. schreibersi*, so consequently *M. australis* ought not to be separated from *M. schreibersi*, but to be regarded as a form of this species remarkable for its extended geographical diffusion and its consequent polymorphism.

As has already been shown, an approach is indicated, through the appearance of a rudimentary lobulus of tragus, between the specimens

in question and *M. tristis*, of which the main characteristics consist in the presence of a well-developed lobulus. Without having seen a specimen of the last-named form, I venture nevertheless to express an opinion as to its validity as a species.

*Hab.* South Australia.

### 3. Description of a new Species of *Laniarius* from Ashantee.

By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received January 30, 1884.]

(Plate V.)

Mr. Godfrey Lagden, who has recently returned from Ashantee, has presented some specimens of birds to the British Museum, amongst which is an example of the present species, a typical *Laniarius*, of the same group as *L. poliocephalus* and *L. hypopyrrhus*, &c., but differing from all in the absence of white lores, the whole of the side-face being dark slaty grey like the crown. I propose for it the name of *L. lagdeni*, after its discoverer.

LANIARIUS LAGDENI, sp. n. (Plate V.)

*Similis L. poliocephalo sed loris et facie laterali saturate schistaceis pileo concoloribus distinguendus.*

*Adult.* General colour above dark olive-greenish, the upper tail-coverts rather yellower and edged with bright yellow at their ends; scapulars like the back; wing-coverts black, broadly margined with bright yellow; bastard-wing and primary-coverts entirely black; quills black, externally olive-greenish, the inner secondaries broadly tipped with yellow, before which is a conspicuous subterminal shade of black; tail-feathers olive-greenish with black shafts, and tipped with yellow, more broadly on the outer feathers; head, hind neck, and upper mantle dark slaty grey, as well as the sides of the neck; lores, sides of face, cheeks, and ear-coverts a shade darker slaty grey than the crown; throat and fore neck brilliant orange, the rest of the under surface bright yellow, the orange colour gradually shading off on to the breast from the throat; under wing-coverts and axillaries bright yellow, as also the edge of the wing; quills dusky below, yellow along the inner web. Total length 10·5 inches, culmen 1·2, wing 4·55, tail 4·4, tarsus 1·35.

*Hab.* Ashantee, West Africa (*Godfrey Lagden*). Type in Brit. Mus.

P.Z.S. 1884. Pl.V.



J.C. Keulemans lith.

Hanhart imp.

LANIARIUS LAGDENI.



February 19, 1884.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during January 1884 :—

The total number of registered additions to the Society's Menagerie during the month of January was 120, of which 7 were by birth, 39 by presentation, 37 by purchase, and 37 on deposit. The total number of departures during the same period, by death and removals, was 125.

The most noticeable additions during the month were :—

1. A young female Babirussa (*Babirussa alfurus*), born January 16th, 1884, of one of the females presented by Dr. F. H. Bauer, C.M.Z.S., in July 1883. This is the first instance of this singular animal having bred in the Society's Gardens.

2. A young example of a small species of Cormorant, apparently the African Cormorant (*Phalacrocorax africanus*), purchased January 31st, 1884, and said to have been received from Sierra Leone. This species is new to the Society's Collection.

Mr. Sclater laid on the table a copy of the lately-issued 'Guide to the Calcutta Zoological Gardens,' by Dr. John Anderson, F.R.S., and called special attention to the following passage respecting an example of *Rhinoceros lasiotis* living in those Gardens since June 1882 :—"The specimen of *R. lasiotis* is an adult female which was caught near Chittagong, on the estate of Begum Latifa Khatum of Ramu, and the following account of its capture appeared in the 'Englishman' of the 17th June, 1882 :—

"This Rhinoceros was captured by the Begum's retainers. A shikaree had gone out to hunt, and when he had reached some paddy fields, he was told by the ryots, who were there at work, that an animal had come out from the jungle on to the fields, and that it was neither a gayl, nor a buffalo, nor an elephant. The shikaree at once sent a messenger to the Begum, asking that assistance might be sent to capture the animal, and, in a short time, a large number of people had arrived armed with sticks. The locality to which the beast had retired presented facilities for its capture, as it was a small isolated hill or *teelah* separated from the high range of mountains to the east. The shikaree arranged his men between the *teelah* and the main range with instructions not to allow the animal to escape in that direction, but that if it made for an adjoining jheel, or for an open slope towards the village, it was to be allowed to pass by either of these ways, as it would be possible to noose it in the jheel, and to capture it if it went to the village. The animal, however, refused to show itself, and did not come out of the dense jungle; but the world-be captors were aware that it was moving round the *teelah*, and at length the shikaree, by climbing a tree, was able to make out that it was a Rhinoceros. They then tied a number of ropes to the branches

of the trees, letting them hang down as nooses, in the course the animal was following. In a short time their labour was rewarded, as it ran its head first into one noose, and then into another, tearing them away, however, from the trees, and, in its excitement, rushing out on to the open slope leading to the village, dragging the ropes after it. By this time it was somewhat exhausted, for it fell in a muddy hollow, where it was immediately surrounded, secured by ropes, and ultimately dragged into the village. Three days afterwards, the male made its appearance from the same teelah, but unfortunately an effort made to capture it did not prove successful. The female rapidly became tame and tractable, and was introduced into the Zenana, where it soon established itself as a favourite, more especially with the children, who used to ride as safely on its back as the London children did on Jumbo. Begum Latifa Khatum, when she became aware that the Committee for the management of the Calcutta Gardens were in quest of Rhinoceroses, with very great self-denial, public spirit, and liberality made up her mind to part with the favourite of the Zenana, and telegraphed to the Committee that it was her intention to present this Rhinoceros to the Gardens."

Mr. Sclater observed that this animal was of special interest to the Society, because the only previously known example of this Rhinoceros, upon which the species had been based, was the specimen obtained in 1869, also from Chittagong, and still living in the Society's Gardens<sup>1</sup>.

---

Mr. W. T. Blanford, F.R.S., F.Z.S., read the following Report on the Collection of Drawings of Himalayan Birds lately presented to the Society's Library by Mr. Brian H. Hodgson, F.Z.S. :—

"The collection of drawings of birds presented to the Society by Mr. Hodgson, and recently received from Mr. Hume, is of very great value and importance, and the Society is under deep obligations to the liberal donor for this magnificent addition to its library. The whole series comprises 1104 sheets of drawings, on some of which single birds are represented, on others several. Nearly all the drawings are coloured; all, with very few exceptions, are good; many are excellent. In addition to the coloured figures of the birds themselves, many illustrations of nests, eggs, and young are added, together with, in many cases, details of structure and anatomy; the feet, tongues, gizzards, and sterna of very many species being represented. The sheets, too, are in most cases covered with MS. notes on the birds depicted. In all respects the drawings are similar to those of Himalayan Mammalia, already presented by Mr. Hodgson to the Society's library.

"These drawings are the originals from which the copies in the British Museum were taken, and, together with the MS. notes on the same sheets, form the record of Mr. Hodgson's wonderfully comprehensive observations during his long residence in Nipal and Sikkim. Those countries, when Mr. Hodgson commenced his studies,

<sup>1</sup> Cf. List of Animals (1883), p. 126.

were quite unexplored, and Nipal, it should be remembered, is still, with the exception of a very small tract in the lower hills around Katmandu, inaccessible to Europeans.

"Apart from their intrinsic merit as admirable representations of the Himalaya avifauna, these drawings have an especial value for two reasons. In the first place, they have Mr. Hodgson's generic and specific names on them in his own handwriting, and therefore prevent any question as to the species to which these names refer. This is important, because, as is well known, several of Mr. Hodgson's names were printed in British-Museum Catalogues without descriptions, and mistakes were in some cases made by the naturalists, who endeavoured to identify the species without having access to the original types. In the second place, it must not be forgotten that Mr. Hodgson is to this day the only naturalist who has had the opportunity of making large ornithological collections in Nipal, and, as he has never published his observations in full, the notes attached to the present collection form the only record of Nepalese ornithology in existence. It is moreover quite possible, owing to the great destruction of forests in the Lower Himalayas of late years, that no such collections as were made by Mr. Hodgson will ever again be brought together in the same area.

"For the last twelve years the drawings have been lent to Mr. A. O. Hume, and their value is admirably shown by his frequent references to them in the volumes of 'Stray Feathers' and in his work on the 'Nests and Eggs of Indian Birds.' All that is known of the nidification and zoology of several Indian Birds is contained in these sheets. Mr. Hume has added to the value of the drawings, and greatly facilitated their arrangement by numbering them in accordance with the numbers in Jerdon's 'Birds of India' and with the more complete list published in 'Stray Feathers,' vol. viii. p. 81."

Mr. Blanford concluded his remarks by recommending that the drawings should be carefully mounted and arranged, and bound in twelve volumes.

---

The following papers were read:—

1. Contributions to the Systematic Arrangement of the Asteroidea.—II. The Species of *Orcaster*. By F. JEFFREY BELL, M.A., Sec.R.M.S., Professor of Comparative Anatomy in King's College.

[Received January 16, 1884.]

#### *Introductory.*

In addition to the fine series of specimens of *Oreaster* collected by Dr. Coppinger during the voyage of H.M.S. 'Alert' in the Australian seas, the Trustees of the British Museum have lately acquired by purchase some magnificent specimens from Dr. Bolsius of Billiton, and others, less remarkable, from various collectors.

These additions have, as may be supposed, led me to a careful study of the generic and specific characters of these forms; a work in which, unfortunately, one has been able to gain but little assistance from preceding naturalists. The only writer who stands in the front rank of the students of *Oreaster* is Dr. Lütken<sup>1</sup>, and of his work, unhappily, I have been unable to make as full a use as I should have done had he written in a language whose literature was rich enough to justify the time necessary for learning it, or in case I had understood a language which, when all is told, is not spoken by a population exceeding one half that of this metropolis.

I have, however, this satisfactory reflection, that in all, or nearly all, the cases in which I have been able to understand him, there is complete agreement between us.

In the course of the paper I make use of some technical terms, which are either new or have been but little used; and in so doing I fear I shall bring on myself the wrath of Mr. Lyman for forcing the reader to undergo a certain amount of "sawdust swallowing"<sup>2</sup>; but I shall, I believe, thereby adopt a method which is not only approved by the philosopher and logician<sup>3</sup>, and adopted by experts in every branch of art and science, but one which will aid in the two objects that ought now to be very dear to all zoologists—(a) the condensation and assimilation of our technical descriptions, and (β) the preparation for a systematic method of formulation, by means of which intellectual operations may be rendered more easy and more rapid<sup>4</sup>.

It is convenient to have a single term for the line which divides the dorsal surface of the arm into two halves; where this line is most apparent it has the form of a ridge, and I propose therefore to speak of it as the *lophial* line, and of its spines as the *lophial* spines. The five, often prominent, spines which are found at the proximal end of the *lophial* lines may be called the *apical* spines, while the term *apical region* may be well applied to the area contained by the lines which join them to one another.

I have seen no reason for departing from the use of the definite terms *superomarginal* and *inferomarginal* for the upper and lower series of marginal plates; nor can I propose any change in the terms for the adambulacral spinulation (monacanthid, diplacanthid, and triplacanthid) which I suggested in the first of these "Contributions<sup>5</sup>."

Before commencing a systematic study of the species of this genus it is necessary to make oneself acquainted with the character of the modifications which the species undergo during growth. Not only is it necessary to do this for the purpose of correctly discriminating specific forms, but it would appear to be the mode

<sup>1</sup> Videnskabelige Meddelelser (Copenhagen), 1859, 1864, 1871.

<sup>2</sup> See his Introduction to his Report on the Ophiurids of the 'Challenger.'

<sup>3</sup> See Mill, *Logic*, 4th ed. ii. pp. 245-6.

<sup>4</sup> Cf. Owen, *Phil. Trans.* 1850, pp. 496-497; and Allman, *Rep. Brit. Assoc.* 1863, p. 352.

<sup>5</sup> P. Z. S. 1881, p. 499.

best adapted for arriving at some clearer ideas as to the relations of the species among themselves, and the history of an ancient generic group.

First of all, we may well expect some differences in external appearance, in the relations of the greater to the lesser radii, and in the width and proportions of the arms, the moment we know that specimens may attain to a spread of 400 millims. or more, or attain to a height of 120 millims.; while, however, we shall find growth-differences in some, we shall in others, such as *O. nodulosus*, be struck rather by the constancy of proportions in the post-larval stages of development.

Our experience of other long-armed forms, such as *Linckia* or *Ophidiaster*, might lead us to ask, Does *Oreaster*, like these genera, tend to lose its arms, and does it, like them, reproduce itself asexually, or exhibit any other mode of heteractinism? Heteractinic conditions are exceedingly rare among Oreasters, and it follows therefore that the dangers to which the species are exposed are slight, its skeletal structures are very strong, or its power of active or passive defence very great.

As to the danger we know but little; as to the skeletal structure, we know that it is eminently reticulated on the upper surface; and, now, as to the organs of defence, we know that many of the species are well provided with marginal or dorsal spines of considerable length, and that, in some cases, the proper ventral plates are very spinous.

To a certain extent these spines present us with very definite characters. We can, for example, always safely discriminate between *O. lincki* and *O. nodosus*, by examining the free ends of the arms, the sides of which in the former are constantly, and in the latter are never, provided with outstanding spines. So, again, the species described by Perrier under the name of *O. alveolatus* may, as it seems, be certainly separated from *O. lincki*, owing to the fact that the infero-marginal plates bear well or fairly developed spines.

For the purposes of this investigation we shall, perhaps, do well to study attentively one of the species of the genus in which the spinous armature is well developed—*O. armatus*: three specimens, in which R is respectively equal to 23.5, 37, and 85 millims., have at the proximal end of the middle line of each arm a spine measuring 1, 3, and 14 millim. respectively. In ( $\alpha$ ) the marginal plates rarely exhibit any break in their regular granulation; when they do so, we find a naked papilla just projecting beyond the level of the granular investment; no spines are developed in the spaces between the middle lines of each ray; in the centre of the disk is a spine which is about equal in size to those which mark the end of the arms; the other spines along the middle line are nothing more than mere papilliform processes. On the ventral plates spines are developed indeed, but they are as yet only rounded projections which are just beginning to be distinguishable from the investing granules of the ossicles which bear them.

In the next specimen ( $\beta$ ) the spines of such marginal plates as

berr them are all distinct, the spines along the middle line of the arms are beginning to grow up, but only one interradiial spine is as yet developed; the spines on the ventral surface are now more regularly arranged.

In the third or largest specimen ( $\gamma$ ) all the spines—those on the distal marginal plates, those on the middle line of the arm, the central portion of the disk, and those that lie between the inter-radial lines—are all long, strong, sharp, and prominent.

It is clear, therefore, that we have here to do with a condition in which the spines increase in size and number during the growth of their possessor; this is to be insisted on, inasmuch as it is not a condition which always obtains. In some species of *Linckia* we find that the spines diminish in size as the form grows larger; but in that case we also see that increase in size is accompanied by consolidation of the skeletal plates—or, where spines are wanting and plates are not very strong, arms are often found to have been broken off or injured.

The study of individual development and the consideration that the larger the form the greater its need of defence, lead to the supposition that the least modified *Oreaster* will be found to be one that is not specially spinose. This consideration gains in force when we know that a form with feebly developed spines such as *O. nodulosus* has in the most striking fashion the characters of the younger repeated in the older individuals.

In the arrangement, therefore, of the species of the genus, we shall have to commence with those which have the spines least well developed. Next to the non-spinous condition of such a form as *O. nodulosus*, we should probably place those in which a few spines are developed at the proximal end of the arm to defend, so far as may be, the more central, and thereby more precious, portion of the internal organs. The next line of defence is probably that of the free end of the arms, next the ventral plates, and lastly the dorsal surface.

On the other hand, we have in *Oreaster occidentalis* an example of a species in which the marginal spines disappear during growth.

Not only have we evidence of this in Prof. Verrill's original description of the species, but more convincing proofs are afforded by the three specimens in the collection of the British Museum: the smallest of these, one presented and named by Mr. Verrill, never has *more than five* of the superomarginal plates on either side of any arm *without spines*; and a few are also to be found on the infero-marginal spines. The smaller specimen described by Verrill has "from one to four (upper plates) that bear small, short, stout, bluntconical spines near the end of the rays;" this is very much the condition in which I find a specimen collected by Mr. Lockington in San Francisco Bay. The larger specimen described by Verrill had no spines on the superomarginal plates; while a yet larger specimen collected by Lockington has on the terminal plate of some of the rays three minute processes, distinctly smaller than those of the other specimen from the same collector.

When we oppose these facts to those which we have already learnt as to the growth-changes in *O. armatus*, we are met at once by the obvious reflection that the very conditions of the case are exactly reversed. In the one we have the progressive growth; in the other the as marked decline in the size of the spines. When we go further and seek, as we are bound to do, for some explanation, we find that, firstly, the explanation will probably be of this character: Corresponding to the differences in the growth-characters of the spines, there are differences in ( $\alpha$ ) the length of the free and unprotected portion of the arms, which have become proportionately shorter as the means of defence has been lost; or ( $\beta$ ) there has been a consolidation of the skeletal plates, which, becoming thereby stronger, are the better able to withstand attacks from without.

Either of these structural characters could be easily enough investigated and demonstrated by a cabinet naturalist; but in the case now being studied there is not either that concentration or consolidation, which nations as well as individuals have to suffer, when their means of offence or defence are diminished or insufficient.

An explanation must therefore be found in a study of living specimens, with a view to see whether they are provided either with protective colourings or offensive odours; or in the examination of the environment of the Starfish, and the possible absence of creatures strong enough to prey on it. Should the latter be the case, the comparatively rich development of spines in the younger forms would be explained as due to the influence of heredity.

In the classification and description of the species of *Oreaster* it will, for the future, be necessary to bear in mind the two opposing conditions represented by *O. armatus* and *O. occidentalis* respectively, and to endeavour to supplement the technical zoological description of the adult by a history of the growth of the species; for Starfishes, as for birds or monera, the life-history is an essential factor in an intelligent arrangement.

Speculations and considerations such as have here been briefly sketched will not be barren of result if they direct the student of living forms to the closer observation of environment, and to the conviction that faunal lists and lists of collections have a scientific value far above that of a mere catalogue, if to a knowledge of the existence of a given species we can add something of its relations to those other forms with which it lives, and on which it is as dependent as are they on it. In this way some of the dangers of specialization may be diminished if not averted.

#### I. List of the apparently distinct Species of *Oreaster*.

1. *affinis*, M. Tr.<sup>1</sup> p. 46.
2. *alveolatus*, Perrier,<sup>2</sup> p. 243. B.M.
3. *armatus*, Perrier, p. 251. B.M.
4. *australis*, Lütken,<sup>3</sup> 1871, p. 252.

<sup>1</sup> M. Tr. = 'System der Asteriden' by Müller and Troschel.

<sup>2</sup> Perrier = Revision des Stellérides par E. Perrier.

<sup>3</sup> Lütken = Videnskabelige Meddelelser, distinguished by the year.

5. *carinatus*, M. Tr. p. 49.
6. *chinensis*, M. Tr. p. 46. B.M.
7. *dorsatus*, M. Tr. p. 49 (s. v. *clavatus*). B.M.
8. *forcipulosus*, Lütke., 1864, p. 156.
9. *gracilis*, Lütke., 1871, p. 260. B.M.
10. *granulosus*, Perr. p. 236. B.M.
11. *hedemanni*, Lütke., 1871, p. 255.
12. *hiuleus*, M. Tr. p. 48.
13. *lincki*, Lütke., 1864, p. 156. B.M.
14. *mammillatus*, M. Tr. p. 48. B.M.
15. *nodosus*, M. Tr. p. 47 (s. v. *turritus*). B.M.
16. *nodosus* (Gray), Ann. N. H. (1), vi. p. 277. B.M.
17. *nodulosus*, Perr. p. 237. B.M.
18. *occidentalis*, Verrill, Trans. Conn. Acad. I. ii. p. 278. B.M.
19. *orientalis*, M. Tr. p. 128. B.M.
20. *regulus*, M. Tr. p. 51.
21. *reinhardtii*, Lütke., 1864, p. 160.
22. *reticulatus*, M. Tr. p. 45. B.M.
23. *superbus*, Möbius, Abh. Geb. Naturw. Hamburg, iv. 2. p. 3.
24. *tuberculatus*, M. Tr. p. 46.
25. *valvulatus*, M. Tr., Arch. f. Nat. 1843, p. 115.
26. *verrucosus*, M. Tr. p. 49.
27. *westermanni*, Lütke., 1871, p. 257.

## II. List of the more important Synonyms.

1. *aculeatus*, M. Tr. p. 50=*reticulatus*.
2. *clavatus*, M. Tr. p. 49=*dorsatus*.
3. *clouei*, Perrier, Ann. Sc. Nat. (v.), xii. p. 271=*nodosus*<sup>1</sup>.
4. *franklini*, Gray, Ann. N. H. vi. p. 277=*nodosus*.
5. *gigas*, Linnæus, Mus. Tessin. p. 114=*reticulatus*.
6. *lapidarius*, Grube, Arch. f. Nat. 1857, p. 342=*reticulatus*.
7. *mammosus*, Perrier, Ann. Sc. Nat. (5) xii. p. 270=*nodosus*.
8. *mic helini*, Perrier, Rev. Stel. p. 252=*armatus*.
9. *muricatus*, Gray, Ann. N. H. vi. p. 277=*lincki*.
10. *nodosus*, Gray, ibid. p. 277=*grayi* (Bell).
11. *obtusangulus*, M. Tr. p. 51=*Goniaster obtusangulus*.
12. *sebæ*, De Blainville, Man. d'Actinol. p. 236=*reticulatus*.
13. *turritus*, M. Tr. p. 47=*nodosus*.

It will, I think, be found on examination that *Oreaster regulus*, M. Tr.=*O. dorsatus*; that *O. verrucosus*, M. Tr., stands very near *O. nodosus*; and that *O. tuberculatus*, M. Tr., is at most a varietal form of *O. mammillatus*.

*Limits of the Genus.*—It will be seen that I here include the species to which Dr. Gray gave the name of *armatus*, and for which he proposed the generic term *Nidorellia*. With *Nidorellia* Prof. Perrier has associated the form to which Dr. Gray gave the peculiarly inelegant appellation of *Paulia horrida*; and it has therefore

<sup>1</sup> Prof. Perrier's decision as communicated to me by letter.

been necessary to make a close inquiry into the structural characters of an *Oreaster* (e. g. *O. nodosus*), *Nidorellia armata*, and *Paulia horrida*.

One of the leading distinctions of the family Goniasteridæ is the solidity and strength of those ossicles which Gaudry has called interambulacral; among the members of the family in which the "tergal ossicles" are reticulated, *Oreaster*, as exhibited by *O. nodosus*, stands out conspicuously; and we have, therefore, in the first place, to speak of the genus as a Goniasterid in which the tergal ossicles are always so reticulated that pore-areas more or less extensive are observable among them.

So far the definition applies to *Nidorellia* as much as to *Oreaster*; but it could only be applied to *Paulia* by saying that the reticular character is obscured or destroyed by the investing granulation.

Secondly, among the Goniasterids, we find that the two outermost rows of interambulacral plates take on a special development, and form a well-defined margin to the side of the Starfish. These plates may or may not be armed with spinous or tubercular prominences, and they may or may not have smaller plates intercalated among them. In *Oreaster* such plates are never intercalated, the investing granules do not project from their side so as to separate the ossicles from one another, nor are they ever limited to the base, but always pass some way up the sides of the spines or tubercles, when such are developed.

This statement is as true of *Nidorellia armata* as of *O. nodosus*, but it does not apply to *Paulia*.

It would seem to follow, therefore, that Lütken was justified in regarding *N. armata* as an *Oreaster*, and that the return by Perrier to Gray's original view was a retrograde step. For the present, the characters and relations of *Paulia* may be put on one side as well as the exact position of *O. obtusatus*, which must be removed from its original generic position in consequence of the presence of intercalated smaller plates among the marginal ossicles.

The species of this genus fall into two well-marked groups, in one of which large tubercles may be; but spines are never developed; in the other a certain number of spines are constantly present, and they may be both large and numerous. Intermediate to these stand such as have the lophial spines reduced or absent, but others developed on various parts of the skeleton. The two chief divisions may be distinguished as those of the *inermes* and *armati*; and in each the species may be separated according to the number of rows of spines which are typically and most generally developed on the adambulacral plates. In no case do we find a Monacanthid arrangement.

The following series commences with the unarmed, and ends with the triplacanthid well-armed forms.

## A. INERMES.

## MONACANTHIDA.

## 0.

## DIPLACANTHIDA.

*australis.*  
*forcipulosus.*  
*nodulosus.*  
*mammillatus.*  
*valvulatus.*

## TRIPLACANTHIDA.

*granulosus.*

B. Intermediate forms with small spines on plates  
of various orders.

## DIPLACANTHIDA.

*chinensis.*  
*decipiens.*

## C. ARMATI.

## MONACANTHIDA.

## 0.

## DIPLACANTHIDA.

## a. Lophial spines alone developed.

*nodosus.*  
*hiulcus.*

## β. Lophial aided by lateral spines.

*hedemanni.*

## γ. Lophial and superomarginal spines.

*lincki.*

## δ. Inferomarginal spines also.

*alveolatus.*  
*reinhardti.*

## e. Ventral spines also.

*productus.*  
*affinis.*

## ζ. Dorsal spines also.

*luetkeni.*  
*occidentalis.*  
*dorsatus.*  
*reticulatus.*  
*armatus.*

## TRIPLACANTHIDA.

a. Lophial and ventral spines.  
*westermanni.*

β. Marginal spines also developed.  
*superbus.*

γ. Dorsal spines also developed.  
*gracilis.*  
*grayi.*  
*orientalis.*  
*troscheli.*  
*muelleri.*

In the case of such species as I have been able to see I have given a fresh description; where specimens have been wanting, I have, in the case of Dr. Lütken's forms, copied his Latin diagnoses, and for other species I have drawn up brief diagnoses based on the descriptions of preceding writers.

## OREASTER AUSTRALIS.

*Oreaster australis*, Lütken, Vidensk. Med. 1871, p. 263 (Australia).

"*Dorsum altum; brachia angusta, acuta, elongata; radius stellæ major minorem triplum fere æquat; tessellæ marginales c. 21; dorsales angulorum a margine paulum remotæ; tubercula minuta singula in tessellis marginis ventralibus plerumque adsunt, in marginalibus dorsi angulorum vero perpauca, brachiorum crebriora; in tessellis dorsalibus propriis plerumque adsunt, regulariter disposita, series quinas in brachiis formantia, media tuberculis c. 13-14 majoribus gaudente; intimum seriei cujuscunque omnium maximum; aræ poriferæ confluentes, poris numerosissimis; tessellæ ventrales propriæ granulatione obtectæ, haud conspicuæ, granula minuta pedicellariasque numerosissimas lineares elongatas gerunt; papillæ ambulacrales internæ nonæ, externæ ternæ (rarius quaternæ); papillæ orales ori proximæ series singulas (non ut fieri solet duplices) formant.*  
*Hab. ad oras Australiæ (Novæ Hollandiæ)."*

## OREASTER FORCIPULOSUS.

*Oreaster forcipulosus*, Lütken, Vidensk. Med. 1864, p. 156.

"*Brachia angusta, acuminata; radius stellæ major minorem duplum æquat; dorsum deplanatum nodosum; tubercula vel spinæ omnino nullæ in tessellis marginalibus, dorsalibus, ventralibusve, pedicellariæ valvatæ maximæ numerosissimæ (7-15) vero in omnibus hisce tessellis; aræ poriferæ sexseriatæ, sat distinctæ, poris c. 20; papillæ ambulacrales externæ 3 (2-4)."*  
West Africa.

## OREASTER NODULOSUS.

*Pentaceros nodulosus*, Perrier, Rev. Stell. p. 237.

$R=2.3r$ . Disk moderately elevated, arms of moderate width, tapering gradually. The lophial and apical spines absent, and their place taken by the enlargement of the ossicles into convex rounded bodies.

About 17 marginal plates in either series; it is only in the more distal regions that the inferomarginals take any share in forming the sides of the arms. Neither series are spinose.

Adambulacral spinulation diplacanthid, the spines blunt; in the inner row there are ordinarily seven spines, of which the median are the more prominent; in the outer row there are two or three larger spines, one of which is often, when only two are developed, much larger than the other; these spines have a direction a little oblique to the longitudinal axis of the arm. Between the outer and inner rows a well-developed forcipiform pedicellaria is placed. Beyond the outer row there are irregularly shaped separate granules, which appear, at first, to afford indications of a third row of adambulacral spines.

The ventral ossicles are often distinguishable from one another owing to the larger size of the granules in the centre than at the edge of the ossicle; sessile valvular pedicellariæ are richly developed among the granules. Large and coarse granules are also to be observed on the marginal plates, on which, however, pedicellariæ are only rarely developed.

The upper surface, both of the disk and of the arms, is delicately reticulated. The pore-areas are well separated from one another, and are, in all the more proximal parts of the arm, of some size, and contain more than twenty pores.

The areas of the two lower series along the sides of the arms sometimes become fused at certain points; the lower series extend into the space between every pair of superomarginal plates. The granulation on the nodal points is rather more delicate than on the ventral surface, and the sessile pedicellariæ are exceedingly small.

Nearly all the ossicles along the lophial line are enlarged; some are more so than the rest, and two or three generally attain to considerable prominence; those which flank the apical region are large and rounded, and are, like the rest, covered with a close-set investment of rather large flat granules. A few pedicellariæ are to be observed among the granules of the apical region, where no spine or protuberance of any kind is developed. The madreporite forms an elongated oval whose longer axis is directed downwards, and is placed just outside the boundary of the apical region.

Colour (dry) dirty yellow, probably deep yellow in life.

Measurements:—

$R=53$ ;  $r=21.5$ ; breadth of arm at base 18.

$R=70$ ;  $r=30$ ; breadth of arm at base 29.

*Hab.* West Australia (Dick Hartog's Island).

**OREASTER MAMMILLATUS.**

*Oreaster mammillatus*, M. Tr. Syst. Ast. p. 48.

R=2.7 r. Disk moderately elevated, the elevation not confined to the central portion; arms moderate, rather narrow than wide. Lophial line marked by the greater size, and consequent prominence of some of its ossicles; no spines, however, are developed thereon.

About 18 superomarginal and 20 inferomarginal plates; the latter are confined to the ventral surface; the former are, ordinarily, obtusely conical, and the free end is bare of granules, but there is no reason for supposing that these have the functions of spines; similar blunt tubercular growths are to be found on the more proximal inferomarginals.

Adambulacral spinulation diplacanthid; six well-formed spines, not sharp at their tips, and longer mesially than laterally, occupy the inner row; in the outer there are two or three stout short spines; when there are three, the middle one is generally the stoutest.

The arrangement of the ossicles of the ventral face is a little obscured by the coarse granulation by which they are covered; here and there, and especially towards the edges of the disk, some of the granules come to form quite distinct tubercles; the granulation on the marginal plates is sufficiently coarse.

From the nodal points of the ossicles of the back there arise tubercular processes, hardly one of which deserves to be called spinous; the pore-areas between are considerable, not always distinctly separated from one another; three rows are ordinarily to be detected along the side of the arms, and of these the lowest is the most extensive. The ossicles on the apical region are swollen and tubercular.

The madreporite is irregularly shield-shaped, and placed nearly halfway between the centre and the edge of the disk.

Colour, stony grey.

Measurements:—R 118, r 44; greatest breadth of arm 46.

*Hab.* Red Sea; Mauritius.

**OREASTER VALVULATUS.**

For a careful description of this form from New Holland, see the account given by Müller and Troschel; it appears to be most remarkable for its long valvular pedicellariæ.

**OREASTER GRANULOSUS.**

*Pentaceros granulatus*, Gray, P. Z. S. 1847, p. 75.

A triplacanthid unarmed species with the disk depressed, and the habit as much of *Goniodiscus* as of *Oreaster*.

R=2.2 r. Disk depressed; arms rather wide at their base, and not very acute at their tip; lophial ossicles not prominent, and apical spines, as indeed all spines, completely wanting.

About 14 supero- and infero-marginal plates; both sets take part in forming the sides of the arms, are well developed in proportion to the general size of the Starfish, but are always without any spines whatsoever.

Adambulacral spinulation essentially triplacanthid, but care is required in determining the characters of the third row. The plates which carry the spines are strongly convex towards the ambulacral groove; six spines in each innermost series, of which the median are distinctly the longest; none are particularly delicate. In the middle row there is generally only one spine, which is then of considerable stoutness; sometimes a smaller is added to it; those of the third row are most conspicuous when they form a process about half as prominent as the median spine; sometimes it is difficult to distinguish them from the granulation of the disk.

The arrangement of the ventral ossicles may be made out, as the granules which invest them are loosely packed and are of some size; the granules on the marginal plates are much more closely set, are smaller, and form a more regular pavement; the granules are very numerous on the dorsal aspect, tending to be convex, but differing a good deal in size and shape; the poriferous areas are small, as the ossicles are individually large; the lophial series of ossicles have their long axes set at right angles to the long axis of the arm; on either side another series of ossicles reaches to the ends of the arms, while another proceeds about halfway down; some three or four ossicles form a short series outside these last; so that the whole disk is marked by regular rows of convex ossicles. The madreporic plate, as so frequently happens in this genus, is not far from the apical region, is of a moderate size, and fairly prominent.

Colour, when first dried, probably brownish.

Measurements:— $R=60, 46, 45, 41$ ;  $r=29, 22, 19, 18$ ; greatest width of arm 19, 18.

*Hab.* Australia (Swan River; Fremantle).

#### OREASTER CHINENSIS.

*Pentaceros chinensis*, Gray, Ann. N. H. vi. p. 276.

*Oreaster chinensis*, M. Tr. Syst. Ast. p. 46.

The type of Gray's species is now lying before me, and it answers so well to the description given by Müller and Troschel that I feel confident that Mr. Edgar Smith took a correct view when he attached to its board the words, "The same, I believe, as *Oreaster chinensis*, Müller and Troschel."

It will be convenient to give here a diagnosis of the species, couched in similar terms to the others here described.

$R=2.7r$ . Disk rather high, arms pretty wide at their base, narrowing towards the tip; lophial ossicles without spines, save the apical, which are rounded and knob-like; four spinous projections within the apical region.

18 plates in either marginal series; the inferior quite ventral in position, and not set regularly (in the middle line of the arm) below the superior; in the angle of the arm one or more of the superomarginals may be provided with short but sharp spinous projections; all or nearly all the inferomarginals bear short spinous processes; bare of granules.

The diplacanthid arrangement of the adambulacral spinulation is obscured by the elongation, in places, of the granules which cover the adjacent plates; seven short spines, of which the median are a little longer than those to the sides, are developed in the inner row; in the outer there are ordinarily four, not long, but fairly stout, spines; the forcipiform pedicellaria is developed between the spines of each plate. The arrangement of the ventral plates can be made out underneath the granules of various sizes and shapes by which they are closely invested; a few valvular pedicellariæ can be made out among them. The granules on the inferomarginals are rather more, and those on the superomarginal much more delicate.

The poriferous areæ are not large, and are sharply separated from one another; three rows extend along the greater part of each side of the arm; on the sloping sides of the disk a few of the ossicles have spiniform projections which are bare of granules; the granulation of the dorsal surface is by no means coarse, and no pedicellariæ seem to be developed on it. Madreporic plate an elongated oval.

Colour (dry) dead white.

Measurements:— $R=68$ ;  $r=25$ ; width of arms at base 24.

Hab. China.

*OREASTER DECIPIENS*, sp. nov.

A species with the closest external and general resemblance to *O. chinensis*, but distinguished from it by characters to which, in the present condition of our knowledge, we must give the value of specific attributes.

Thus, though it is larger than *O. chinensis*, it is far less richly provided with spines on the marginal plates; there are more spines in the inner, and as a rule, fewer in the outer row of adambulacral spines. In addition to this the disk is quite flat, while  $r : R = 1 : 3.4$ , in place of the much lower ratio of  $1 : 2.7$ , which obtains with *O. chinensis*, and the number of marginal plates is much greater.

Taking into consideration all these differences it seems that we must regard the specimens as belonging to a different species.

$R=3.4r$ . Disk not high; arms rather narrow, tapering regularly. Lophial ossicles without spines, save the apical, which are well developed, and are very prominent on the unarmed disk. There are no spines within the apical region.

About 25 marginal plates in either series; both take part in forming the sides of the arms, are pretty stout, a little convex; only the more distal inferomarginals bear spines, and these are distributed with great irregularity; they are longer and more prominent than in *O. chinensis*; there are no spines at all on the superomarginal plates.

Just as in *O. chinensis*, the adambulacral spinulation appears in places to be triplacanthid owing to the elongation of the adjacent granules; it is, however, really of a diplacanthid character.

There are 9 spines in the inner row, and they are exceedingly delicate; none are long, but the median are much longer than the lateral ones. Between each plate stands a forcipiform pedicellaria.

In the outer row there are ordinarily two very well-developed spines, though, here and there, three are to be detected.

None of the ventral plates bear spines; some of the granules on the more proximal of them are larger than the rest, and form very distinct aggregates. The valvular pedicellariæ scattered among them are small and not very numerous. The poriferous arææ on the dorsal surface are arranged in three very regular rows along either side of the arms; the arææ are not very large, and the pores are not numerous. The granules on the upper are larger than those on the ventral surface, and have no pedicellariæ scattered among them. Towards the end of the arm the lophial ossicles may project a little, but they never develop spines. Madreporic plate set just between two of the apical spines, irregularly lozenge-shaped, not large.

The integument is much thicker than in most species of the genus, and the specimen has the dead-white colour which we can imagine *O. chinensis* would have had had it been preserved in spirit.

Measurements:— $R=116$ ;  $r=35$ ; greatest breadth of arm 28.

*Hab.* Billiton.

#### OREASTER NODOSUS.

*Pentaceros turritus*, Perrier, Rev. Stel. p. 240.

*Asterias nodosa*, Linnæus, Syst. Nat. ed. xii. p. 1100 (pars).

Prof. Perrier prefers Linck's name to that of Linnæus, whom, indeed, he abstains from directly quoting, his only reference being to Gmelin's edition of the 'Systema Naturæ.'

$R=2.5r$  to  $3r$ . Disk considerably elongated; arms long, rather narrow. Lophial line well marked, with prominent rounded projections; the apical spines very prominent, and a central one typically developed.

About 30 superomarginal, and one or two more inferomarginal plates; both sets obscure, and without any spines, the lower altogether confined to the actinal side.

Adambulacral spinulation diplacanthid; ordinarily seven spines in the inner row, of which two or three in the middle are distinctly longer than those at their sides. In the outer row three spines, about twice as stout as those of the inner row; between the two rows there stands a well-developed forcipiform pedicellaria.

The separate ventral ossicles are a good deal obscured by the coarse granulation with which they are covered; the only region in which there can be said to be a distinctly serial disposition of the plates is that which extends along the side of the ambulacral groove. Many of the investing granules are more than a millimetre in length along their longest axis, and the sessile valvular pedicellariæ are very numerous represented. A similar coarse granulation is found on the marginal plates; but any resemblance to *O. lincki* is opposed by the development of a very large number of pedicellariæ<sup>1</sup>.

The upper surface might almost be said to be one mass of pedi-

<sup>1</sup> Have we not here another example of the kind of balance that obtains between the development of spines and of pedicellariæ? Cf. the case of *Asterias glacialis*, Zool. Anz. 1882, p. 283.

cellariæ, for they not only cover the reticulating bars of the dorsal ossicles, but invade also the poriferous areas; the granules, of ordinary character, are confined to the knobs and spines, the tips of which, however, they do not cover. Along the lophial line the projections are always rather tubercular than spinous, but the five spines at the angle of the apex and the central spine within are exceedingly well developed and rather acutely pointed. A few rounded tubercles, similar in character to those of the lophial line, are developed at the sides of the disk. In dried specimens the disk rises up in an altogether turritiform fashion. Madreporite small, rather obscure, on one of the sides of the disk.

Colour (dried) greyish sandy.

Hab. Indian Ocean generally.

Measurements :—

R .....	165	130	118	100
r .....	62	44	46	37
Height of disk .....	58	45	31	27
Length of longest spine ..	15	14	21	18

It is to be observed that there are some not unimportant variations in the characters of the spines: those of the lophial line are sometimes sharp, are not always blunt; the apical spines appear to be liable to early division into two or three secondary apices, or they may give off a spur or projection, and, lastly, the processes at the sides of the disk may become quite sharp.

#### OREASTER HIULCUS.

*Oreaster hiulcus*, M. Tr. Syst. Ast. p. 48.

The most important difference between this species and the preceding would appear to be the character of the granulation of the dorsal ossicles and the much feebler development of pedicellariæ.

Müller and Troschel, who alone (Syst. Ast. p. 48) have given a satisfactory account of the species, give the habitat as the Indian Ocean; Prof. Perrier would appear to know of it only as from Zanzibar and Mauritius.

#### OREASTER HEDEMANNI, Lütken.

*O. hedemanni*, Lütken; Vidensk. Med. 1871, p. 263.

"*Dorsum sat altum, brachia triangularia, mediocria, acuta; radius stellæ major minorem duplum et dimidium aequat; tessellæ marginales utrinque c. 15, dorsales ventralibus magnitudine aequales, parte externa brachiorum forsitan excepta haud alternantes et in peripheria stellæ formanda æqualiter participes; nonnullæ (dorsales sc. 5, ventrales 5-6, ad angulos stellæ sitæ, nec non 1 vel 2 versus apices brachiorum locum tenentes) tubercula minuta gerunt; aræ poriferae regulares, sejunctæ, poris numero mediocri, juxta tesselas marginales maximæ; tubercula dorsualia quinque sat magna apice nuda, spatiis diametros basales æquantibus inter se separata, tuberculum centrale mediocri circumdant; series fere*

*continua tuberculorum similium 7-9, versus apices brachiorum descendentium, carinas brachiorum coronat; minora 1-3 in lateribus brachiorum series duplices utrinque formant: ad angulos stellæ vulgo nulla; tessellæ ventrales propriæ sat magnæ, sejunctæ, granula majuscula, tuberculis haud intermixta, gerunt; pedicellariæ lineares elongatæ in vicinis ambulacrorum, rariores in dorsualibus tuberculis destitutis, conspiciuntur; papillæ ambulacrales internæ 7, externæ 2 (rarius 1 v. 3), complanatæ; orales series duplices formant, internas 12, externas 5 numerantes. Hab. ad oras insulæ indicæ Billiton (specimen junior?)."*

#### OREASTER LINCKI.

*Asterias lincki*, De Bl. Dict. Sci. Nat. lx. p. 219.

*Pentaceros muricatus*, Perrier, Rev. Stel. p. 239<sup>1</sup>.

R=3r. Disk moderately high; arm moderately wide, not at all acutely pointed. Lophial spines well developed, the apical very prominent; a spine or two sometimes developed within the apical region.

About 18 marginal plates; the superomarginals alone form the sides of the arms, and are alone provided with spines; these are confined to the distal end, and vary considerably; from one to four may be developed, and in some specimens they are twice as long as they are in others.

Adambulacral spinulation diplacanthid; in the inner row eight poorly developed spines, in the outer two, which are much stouter, for each plate; the tips of the latter are often marked by several shallow grooves; as so frequently happens, a forcipiform pedicellaria is developed between each inner group of adambulacral spines.

The separate ventral ossicles are hardly, if at all, to be made out under the exceedingly coarse granulation by which they are covered; the separate granules vary considerably in size, and a few valvular pedicellariæ are scattered among them. The granules on the marginal plates are hardly less coarse. The dorsal surface is rendered markedly reticulate by the great size and close approximation of the poriferous areas, two of which pass along each side of every arm; in the middle of the arm the second of these may equal in length as much as half the whole height of the arm; sometimes the connecting processes of the ossicles become very delicate, when the whole side of the arm appears to form a huge poriferous area. Spines are very irregularly developed at the angle of the areas; sometimes they are distributed so regularly that one may almost speak of a regular row of spines running on either side of the lophial series; in other cases they are completely absent. This happens sometimes also to the spines of the lophial ridge itself, but they are ordinarily very well developed, as are, too, the apical spines and the spines that stand below them on the sloping sides of the disk. The granulation on the dorsal spines and ossicles is very coarse and extends sometimes quite

<sup>1</sup> M. Perrier here adopts the name of Linck; a course in which, I regret, I cannot follow him.

to the tips of the spines. Madreporic plate rather small, not conspicuous.

Colour (when dry)—lower surface reddish, upper reddish where the granules are developed, with grey poriferous areas; in some cases the dried specimens are almost white, but this may be due to the mode of drying.

The above description has been drawn up from a set of five specimens, which were collected at the same time and place (between tide-marks, at the Mozambique, in May 1882) by Dr. Coppinger, H.M.S. 'Alert', and illustrate the exactness of the statement of Dr. von Martens:—"Alle diese Variationen kreuzen sich so sehr durcheinander, dass man darnach keine irgendwie bestimmbar Lokalvarietäten aufstellen kann"<sup>1</sup>. The variations are so marked that it seems to be impossible to follow Dr. von Martens in establishing definite "varieties." The exact state of the case is, I think, this. The strength of the marginal and ventral plates, with their coarse granulation, is sufficient for the safety of the Starfish; the spines are additional defences that are not constantly needed, and are developed more according to the conditions of individual environment than in obedience to the necessities of the species. They are organs which have begun to disappear, and their importance to their possessor may be judged of by the extent to which they vary in number and size on the different arms of one and the same individual. The species stands midway between *O. alveolatus*, in which inferomarginal spines are also developed, and *O. nodosus*, in which there are no marginal spines at all.

*Hab.* Indian Ocean (Mauritius, Timor).

R.....	110	95	80	64
r.....	40	34	28	26
Greatest breadth of arm ....	35	34	31	26

#### OREASTER ALVEOLATUS.

*Pentaceros alveolatus*, Perrier, Rev. Stell. p. 243.

At first sight this species has the most remarkable resemblance to *O. lincki*, but it is at once to be distinguished from it by the constant possession of inferomarginal spines.

$R=2.7r$ . Disk very high, lophial line well marked; lophial spines well developed; apical very prominent. The arms diminish but little in breadth from the proximal to the distal end.

About 21 marginal plates; at the angles the inferomarginals form the sides, while the superomarginals are rather obscure, and these inferomarginals are provided with rather short spines; the superomarginals gradually become larger, and oust the inferior plates from any share in forming the sides of the arms, while they develop prominent spines; towards the tip of the arm spines, or spinous tubercles, reappear on the inferomarginal plates.

Adambulacral spinulation diplacanthid; five or six spines in the inner row, not remarkably delicate; those of the outer row pretty stout and arranged by twos or threes. A spiniform pedicellaria is

<sup>1</sup> Arch. für Naturg. xxxii. 1886, p. 79.

ordinarily developed between the successive sets of spines. The ventral plates are thickly covered with granules irregular in, but often remarkable for, their size; moderately-sized valvular pedicellariæ will be found pretty numerous scattered among them. Large granules and pedicellariæ are developed on the inferomarginal plates; the granules on the superomarginals are not quite as coarse, and pedicellariæ there appear to be wanting.

The poriferous areæ on the dorsal surface are very abundant and of large size; the ossicles are elongated and narrow, and are set at right angles to the long axis of the arm. The well-developed lophial ossicles are frequently blunt at their tips, and then appear to be covered with granules; when the tips are sharp they are bare of granules; the apical spines are very prominent, the contained area free of spines, the arms surrounded by a well-marked granulation; valvular pedicellariæ are to be here and there detected on the dorsal surface. The madreporic plate is of an irregular shape.

Colour (dry) brownish or light grey, the lophial spines rather darker than the rest.

Measurements:— $R=100, 104$ ;  $r=37.5, 38$ ; greatest breadth of arm 31, 33.

*Hab.* New Caledonia.

#### OREASTER REINHARDTI.

*Oreaster reinhardti*, Lütken, Vid. Med. 1864, p. 159.

"*O. reinhardti* differt ab *O. linckii* brachiis crassioribus, spinis dorsi paucioribus et minoribus, areis poriferis superioribus haud confluentibus, in seriebus duabus alternantibus vero dispositis, papillis ambulacralibus interais 4-5 (non 6-7) minus gracilibus, pedicellariis interpositis hisce minoribus (non illas superantibus)."

Nicobar Islands.

#### OREASTER PRODUCTUS.

$R=4r$  to  $4.6r$ ; disk flat, lophial spines not strongly developed; spinous tubercle on both supero- and inferomarginal plates; on the latter there may be two or three on each; spines also developed on the ventral plates. The arms long, not wide at their base, tapering somewhat rapidly; superomarginals about 35, inferomarginals one or two less, groove of division obscure, angles between the plates with, at the angles of the arms, a few (less than ten) pores; these diminish in number at the sides, and disappear towards the ends of the arms. Even in a specimen where  $R=150$  mm. we find that the superomarginals may be without any spinous tubercles; these, when they are developed, are not large, nor are they regularly set on all the plates; the inferomarginals, at the angles of the arms, may be armed with five or six small spines, one of which is often more prominent than the rest; as they pass outwards the spines diminish in number, though they may increase in size; on the distal half of the arm there is only one spine on a plate.

Adambulacral spinulation diplacanthid; spines of inner row eight to ten, the median the longest, all very delicate; spines of outer row

four, well developed. All the ventral spines on the disk with one or two spinous tubercles; owing to the narrowness of the arm only one row extends along the side of the adambulacral spines, and the plates at the distal end of this are without spines.

The pore-areas of the dorsal side are distinctly marked, but vary considerably in size and form; the apical region has no central spine, and the most prominent spine of the row along the lophial line is not at all high; none of the spines along the lophial line are especially prominent, and they are not always separated from one another by equal distances; at the distal end of the arm they may become rounded tubercles. Madreporic tubercle moderate, just outside the apical region, lozenge-shaped.

Colour (in alcohol) creamy yellow.

R=148, 220.  $r=32, 53.5$ . Breadth of arm at base 32, 50.

Hab. Billiton.

OREASTER LUETKENI, sp. nov.

A diplacanthid form, with the appearance, were it not for the shallowness of its disk, of *O. reticulatus*. Supero- and inferomarginal spines; the ventral plates without spines, but most abundantly provided with pedicellariæ.

R=2.4 r. Disk not elevated: arms, where distinct from the disk, rapidly tapering; most of the supero- and of the inferomarginal plates provided with spines; of the lophial series the apical spines are alone well developed; short, but quite distinct spines developed at all the angles of the poriferous area.

There are about 21 plates in either series along the side of the arm, but the whole of the side of the arm is occupied by the superior set. The disposition of the spines on these plates is exceedingly irregular: only about half of the plates are spiniferous; spines on the inferomarginals are rarer and much less developed. In both series plates without spines will be found to carry, perhaps as many as three, pedicellariæ.

Of the adambulacral spines the inner row has 8 for each plate; these are not very delicate, nor are they exceedingly different in length; between each set is an elongated forcipiform pedicellaria. The outer row has, as a rule, two pretty stout spines on each plate. The ventral plates are remarkably distinct from one another, the granules often larger, the valvular pedicellariæ of some size, numerous, especially in the neighbourhood of the ambulacra. The ventral plates which extend along the lower side of the arm often intervene between the inner edges of the inferomarginal plates. The whole of the dorsal surface is rough with spines; the pore-areas are, on the back, very distinct, and generally triangular; they are specially large along the sides of the arms, the pores large; the granulation is rather coarse and the granules reach very nearly to the tip of the spines and spinous tubercles. Madreporic plate large, irregular in shape.

Measurements:—R=117;  $r=48$ ; greatest breadth of arm 3.5.

Colour, brownish (in alcohol).

Hab. Billiton.

**OREASTER OCCIDENTALIS.**

*O. occidentalis*, Verrill, Trans. Conn. Acad. I. ii. (1867), p. 278.

$R=2.5$  to  $2.17r$ . Disk not high; arms not wide, tapering pretty rapidly. Lophial line not prominent, some of the ossicles provided with short, sharp, inconspicuous spinous processes. There are some spines within the apical region.

About 22 superomarginal and 20 inferomarginal plates in the largest specimen examined; the latter would not seem to be completely confined to the ventral aspect, though in the process of drying they may often be drawn thither. Both sets of plates are fairly well developed, and are richly covered with granules; on the whole they are perhaps more indistinct than in any other species of the genus. From among the granules there stands up on a few of the plates of either series a very small and inconspicuous spinous process, and the disposition of these spines differs on different arms and on different sides of the same arm.

Adambulacral spinulation diplacanthid; about seven or eight spines ordinarily developed in the inner row; these are not so strong as are two out of the three which are developed in the outer row, where the third, if present, seems to be always smaller than the other two.

The whole of the ventral surface proper is closely covered by large and coarse granules, not a few of which become almost spinous in character; among these only a few pedicellariæ are developed.

The poriferous areæ are arranged in three fairly regular rows along the sides of the middle line of the arm; the areæ of the innermost are the smallest and those of the outermost the largest in extent; at most of the nodes formed by the reticulating dorsal ossicles a small spinous process is developed, but in the adult this is nearly always inconspicuous. The granulation on these ossicles is rather coarse, though by no means so coarse as on the ventral surface, but it always leaves bare the spinous process.

The madreporite is triangularly cordiform, the apex being directed towards the apical region, just outside which it is placed.

Colour in alcohol said by Verrill to be greyish brown: it has something of the same colour when dried.

As has been pointed out in the introduction to this paper, this species undergoes during the later stages of its growth some very considerable changes in the characters of its spinulation; the spines in the younger being very much better developed than in the older forms.

**Measurements:—**

R .....	90	115	148
r .....	39	53	59
Breadth of arm at base .....	37	46	45

*Hab.* Western coast of Central and Northern America.

## OREASTER DORSATUS.

*Pentaceros dorsatus*, Perrier, Rev. Stell. p. 245; but substitute the following for the inexact synonymy there given:—

1753. *Asterias dorsata*<sup>1</sup>, Linnæus, Mus. Tessin. p. 114, pl. ix. 2.

1758. Seba, Thesaurus, iii. pl. v. 7, 8, pl. vi. 1, 2.

1766. *Asterias nodosa*, Linnæus, Syst. Nat. p. 1100 (*pars*).

1842. *Oreaster clavatus*, M. Tr. Syst. Ast. p. 49.

1864. *Oreaster dorsatus*, Lütken, Vidensk. Med. p. 161.

This species has been so admirably diagnosed by Müller and Troschel that had I not here the object of giving original and similarly constituted definitions of such species as I have seen, I should gladly content myself with referring the student to their description.

$R=2.2r$ . Upper surface, in dried specimen, almost flat; arms not acutely pointed. Lophial line and spines distinct, the apical not especially prominent; spines developed within the apical region.

About 12 supero- and 14 inferomarginal spines, the latter distally, but not proximally taking a share in the formation of the side of the arm. Both sets are provided with spines; on the upper plates these spines are of some size, and frequently two are developed; these are set one above the other so as to lie at right angles to and not parallel with the long axis of the arm. Two spines are likewise often developed on the inferomarginal plates; these spines are sometimes of a fair size, but are frequently rather tubercular than spinous.

Adambulacral spinulation diplacanthid; three strong and often subequal spines in the inner, and one very stout, with rounded tip, in the outer row.

The separate ventral ossicles are quite easily made out under the rather coarse granulation by which they are invested; the row of ossicles running along the side of the adambulacral series is without spines, but those outside this, of which there are four in the proximal and two in the most distal region, are provided with one and sometimes with two rounded spinous projections.

The upper, like the lower surface, is well provided with spines, and here again two are frequently found to be developed on the free surface of one and the same ossicle. The lophial ossicles are large; as large indeed, if not larger than, the more proximal superomarginals;

<sup>1</sup> The only foundation for the statement of Müller and Troschel, reiterated by Perrier, that in the Mus. Tessin. Linnæus called this species *A. stellata*, is the fact that the word *stellata* is the first in the definition of the species. As the work is rare (the copy from which I took this note was one which I saw, by the kindness of Professor Lindström, in the admirable Library of the Royal Academy of Sciences at Stockholm), I think it well to give in full what Linnæus said:—

"*Dorsata*. *Asterias stellata*, radiis convexis longitudinaliter elevatis. Tab. ix. fig. 2.

Locus: India.

Stella spithami diametro. Radii quinque, obtusi, versus basin dilatati, dorso admodum convexi, adpersi undique mucronibus obtusiusculis remotis.

Subtus plana, adpersa punctis prominulis; rima cincta papillis subulatis, tenuissimis."

spines are not developed on all, though they are on most of the ossicles; and we frequently find, though without any definite regularity, that two, or it may be three, spines are developed. When this happens the spines are so set side by side as to lie across the long axis of the arm; they are not large, but their free end is always bare of granules. The ossicles extend almost to the centre of the disk.

In addition to the lophial spines a number of others, almost if not quite as large as they, are also developed; a definite row runs down either side of the lophial line, and in the wider portion of the disk two other rows of spine-bearing ossicles are less distinctly developed. The pore-areas are extensive, but not sharply distinguished from one another, and the individual pores are large. The close granulation of the superior ossicles and the intermediate pore-areas is hardly less coarse than that of the lower surface. The madreporite is of moderate size, irregularly elliptical, and about its own long diameter from the centre of the disk. Notwithstanding the statement of Müller and Troschel, I venture to think that a perfect specimen would present at any rate a few pedicellariæ.

Colour (when dry): the distal parts of the arms light, the proximal brown, above; the whole greyish brown below. The specimen here under description is stated to have had the "tops of prickles scarlet-red, upper surface tile-red."

It was collected by Mr. Darwin at St. Iago, Cape Verde Islands.

Measurements:— $R=95$ ;  $r=42$ ; breadth of arm at base 41 millim.

#### OREASTER RETICULATUS.

*Pentaceros reticulatus*, Perrier, Rev. Stell. p. 246, where see the complicated synonymy, and therein make the following corrections and additions.—

Insert "1766, *Asterias reticulata*, Linn. Syst. Nat. ed. x. p. 1099."

Add "page, p. 14," to "Retzius (1805)."

After "(1840) *reticulatus*," add "*aculeatus*, p. 277."

Add to reference to Grube in Archiv of 1857,—"*Nova Acta Ac. L. C. xxvii.* (1860), p. 17;" and delete the words "*et Oreaster gigas*."

Correct page of reference to Lütken (1859) to "p. 64."

For "1862, *Oreaster tuberosus*, Belm.,"—read "1859, *Oreaster tuberosus*, Möbius, Neue Seesterne, p. 6, in Abhandl. Geb. Naturw. (Hamburg), iv. p. 2. The specific name was suggested by Prof. Behn."

Complete reference to Agassiz,—"*no. 9* (1869), p. 307."

The numerous names given to this species will afford some indication of its variability; it will perhaps be most convenient to commence with an account of a large almost perfect (though dried) specimen.

$R$  is about equal to  $2r$ . Disk exceedingly high; arms rapidly tapering from their base, rounded, not carinated, so that the lophial line is very indistinct; spines developed within the apical region.

Sides of the arms formed by the superomarginal plates only: of these there are rather more than 20 on either side of each arm; they are regularly provided with long strong spines, which are nearly always rather acute, and only become distinctly shorter near the distal end of the arm. The inferomarginal plates are not quite so numerous as the superomarginal; they are almost without exception provided with one, and in some cases with more than one, spine; these vary a little in size, but are always much smaller than those on the upper plates.

Adambulacral spinulation diplacanthid, three inner and one outer being the ordinary arrangement; the inner are quite small, the outer of fair size, and not sharp at their tips. The whole of the ventral surface is spinous, owing to the rich development and the regular distribution of the spines which are found on it; there are as many as six rows in the proximal and three in the distal region; the spines would seem to be carried on separate ossicles, and while each ossicle has one, it may sometimes have two or three large spines, or a larger number of smaller ones; speaking generally, the larger spines are the more proximal. Between the spines are found coarse, separate granules, and a fair number of sessile bivalved pedicellariæ.

In the specimen under description the bases of the ossicles are particularly thick, except along the lophial line; a large number of the pore-areas have the form of an equilateral triangle, and are quite distinct from one another; as a rule the best-developed spines of the dorsal surface are those which are found on the nodes of the reticulations; between these somewhat smaller ones are not unfrequently developed; the spines along the lophial line are, on the whole, rather stouter than the rest, but they are by no means conspicuously so. There are no prominent spines on the apical portion of the disk; and the madreporite is of moderate size and somewhat irregular shape.

Colour dark brown; but other specimens are white.

Measurements:— $R=186$ ;  $r=86$ ; height of disk 116 millim.

*Hab.* "West Indies;" two small specimens in the Museum collection are from Fremantle, Australia.

Owing, no doubt, to the great size to which this species attains, many of the incompletely grown forms have been regarded as representatives of distinct species; nor has this, as it seems, been the only cause of the many names given to it. The *O. lapidarius* of Grube is no doubt a remarkable form at first sight, but the appearance is to be explained by the dried and injured condition of the specimen.

#### OREASTER ARMATUS.

*Pentaceros (Nidorellia) armata*, Gray, Ann. N. H. vi.

*Oreaster armatus*, M. Tr. Syst. Ast. p. 52.

*Nidorellia armata*, Perrier, Rev. Stell. p. 251.

*Nidorellia michelini*, Perrier, Rev. Stell. p. 252.

The conception of the limits of a genus vary, of course, considerably, but the close study of this species seems to show that M. Perrier has elevated into generic what are only specific cha-

racters. He speaks, for example, of the difference of the form of the body between *N. armata* and any species of the genus *Oreaster*, as he regards it. But a comparatively insignificant difference in the value of  $\frac{R}{r}$  is not even a subgeneric character. The second point of difference is, in Prof. Perrier's words, "le peu de saillie des ossicules dorsaux qui sont à peine distinctes," but they are, at any rate, just as clear as they are in *O. granulosus*, and, indeed, they are much more so, while there are specimens of *O. gracilis* in which the lophial line is no more distinct. M. Perrier proceeds, "Les aires porifères sont larges, confluentes et paraissent même parfois envahir toute l'étendue du disque." In young specimens the poriferous areæ are much more distinctly marked off than in *O. alveolatus*; if there is any disadvantage to the side of *O. armatus* with respect to its alveolation, when adult, it is no doubt to be correlated with its better development of long defensive spines. It is not always the case that the spines of species of true *Oreasters*, according to M. Perrier—take, for example, his own species *O. alveolatus*—are always free of granules at their tip; we find so many intermediate stages between a complete investment and an almost complete absence of granules that this character, again, must not be regarded as having, at the utmost, more than a specific character.

The species may be defined in the following terms:—

$R = 1.7r$  to  $2.1r$ . Disk not high, arms very short, interbrachial angles rounded; lophial and apical spines very strong, intermediate spines and spines on marginal plates exceedingly well developed; spines likewise developed on the ventral plates.

Nine plates in the supero- and nine in the inferomarginal series; the latter all bear spines, which are short in the angles and of a moderate size near the distal ends of the arms; the three or four spines found on the distal plates of the superomarginals are much larger; the superomarginals are greatly elongated from above downwards in the angles of the arms, where they almost shut off the inferomarginals from any share in forming the sides of the arm; further out the plates become shorter, but the penultimate is very large and convex.

Ambulacral spinulation diplacanthid; three or four fairly developed spines in the lower, and one much larger in the outer row. The ventral ossicles covered with rather coarse granules, and each having, rising from its centre, a blunt stout spine; some large valvular pedicellariæ are developed on these plates; the granules on the inferomarginals are only a little less coarse than those on the ventral ossicles, but the greater number of those on the superomarginals are much more delicate; pedicellariæ are only feebly developed. With increasing size the boundaries between the poriferous areæ become largely obliterated; just at the interradian angles, however, the ossicles are stouter in older than in younger specimens.

The lophial spines are strong and sharp in the adult; between them some few spines may become developed; and in the centre of the apical region there is a spine as long or nearly as long as the apical. A few pedicellariæ are developed on the dorsal surface, the

general granulation of which is rather delicate. In the adult the shield-shaped madreporic plate is covered with granules.

Colour (in spirit) creamy white or white.

Measurements:—

R. ....	24	*27	47	*48	84
r .....	16	16.5	22	23	50
Length of longest spine.	1.5	3	3.1	6	15

The two specimens whose admeasurements are marked with an asterisk were determined by M. Perrier as examples of his species *N. michelini*; but there can hardly be any doubt that within the limits of a millimetre or two differences may always obtain in the development of defensive spines, and the two species may well be united.

*Hab.* W. coast Central America; Sandwich Islands.

#### OREASTER WESTERMANNI.

*Oreaster westermanni*, Lütken, Vidensk. Med. 1871, p. 264.

"*Dorsum deplanatum fere, brachia longissima, radio stellæ majore minorem triplum quinta parte superante; tessellæ marginales admodum convexæ, alternantes c. 30; dorsuales, tuberculis 1-4 minutis obsitæ, solæ (apice brachiorum excepta) ipsum marginem stellæ formant; aræe poriferæ triangulares, sæpe confluentes, poris numerosissimis; tubercula numerosissima mediocria obtusa in nodis trabecularum, in parte centrali stellæ et basali brachiorum conica vel cylindrica fere, in parte terminali brachiorum crassiora, convexa, approximata, tessellasque marginales fere æquantia, series quinas in brachiis formant, media c. 30 numerante; tubercula 5 duplici paullo modo majora et parum inter cetera conspicua partem centram stellæ circumdant; tessellæ ventrales propriæ tuberculiformes, minutæ, numerosæ, propter granula obtegentia haud conspicuæ, præter granula singulam (prope ambulacra duplicem vel triplicem) spinam crassam obtusam gerunt; papillæ ambulacrales triseriatæ, internæ nonæ graciles, ceteræ crassæ, obtusæ, ternæ (rarius binæ vel quaternæ); pedicellariæ valvulatæ minutæ raræ prope ambulacra. Hab. ad oras Bengalæ.*"

#### OREASTER SUPERBUS.

*Oreaster superbus*, Möbius, Neue Seesterne, p. 5; Abh. Geb. Naturw. Hamburg, Bd. iv. Abth. ii.

The figures of Möbius show that this is a really remarkable species, on account of the knobbed character of its spines, and the apparently restricted size of the poriferous areas.

It would seem that R is about equal to 4r; the lophial line distinguished by the presence of knobbed processes, somewhat irregularly, but always closely, arranged. Some of the more proximal superomarginals bear knobbed spines, and the inferomarginals till about the middle of the arm have two, whereof the

outer is thicker than the inner. The ventral plates each bear a spine; the ambulacral spinulation is triplacanthid.  $R=200$  millim.  
*Hab.* Sumatra.

**OREASTER GRACILIS.**

*Oreaster gracilis*, Lütken, Vidensk. Medd. 1871, p. 260.

As there is in the British Museum collection a specimen the spread of which must exceed the largest of Dr. Lütken's specimens by more than 50 millim., it may be convenient to give an account of it.

$R=2.87r$ . Disk not elevated; arms narrow at their base, slender in proportion to the disk; lophial line well marked, but not projecting; the apical spines of moderate height, and a smaller central spine.

About 30 superomarginal and inferomarginal plates; the greater number of these are large, and both sets take part in forming the sides of the arm. In the angles of the arm they are elongated from above downwards; further out the upper are longest in the direction of the long axis of the arm, while the lower are squarish. In the specimen under description the two inferomarginals in the angle of the arm are always, and the corresponding superomarginals are sometimes, provided with bluntly conical spinous projections; inconspicuous tubercular projections are developed on a few of the quite distal superomarginal plates.

Adambulacral spinulation triplacanthid; in the innermost row ordinarily nine rather delicate spines, of which the median are the longest: the middle and outer rows have generally two spines each; these are stouter than the inner spines, and those of the median are a little stronger than those of the outer row. The ventral plates are quite distinct from one another, the covering granulation being so arranged that each ossicle seems to have its proper investment; on the actinal surface of the disk these ossicles seem to have no definite arrangement; along the greater part of the arm there runs but a single row of ossicles between the ambulacrum and the inferomarginal plates; these ventral ossicles are all of the same size, and the larger may be often seen to have pushed their way into the slight space between two succeeding inferomarginal plates. Fair-sized pedicellariæ are developed on some of the ossicles that lie nearest to the adambulacral plates.

The marginal plates are very regularly granulated, and appear to be altogether devoid of pedicellariæ. The granulation on the upper surface is still more delicate; the general appearance of this aspect of the disk is well stated in the words of Lütken, "*Dorsum disci regulariter reticulatum, areis poriferis trigonis, nodis trabecularum tuberculiferis;*" but of this specimen it is hardly correct to add "*tuberculis minutis.*"

In the face of the fact that this is a larger specimen than either examined by Dr. Lütken, and that the tubercles at the nodal points of the reticulating ossicles are, so far as one can judge, better developed than in his specimens, the question arises as to the extent

to which one may suppose that the spines vary in length and strength.

The first explanation that one would be led to give would probably be to some such effect as this. The specimen now under consideration is larger than Dr. Lütken's specimens because it is better provided with spines, and has therefore had less difficulty in maintaining its existence.

On the other hand, we do not and never can know what Dr. Lütken's specimens might have accomplished in the way of growth had they not fallen victims to the zeal of a collector.

All, then, that we can say is, that of known specimens of *Oreaster gracilis* the largest has the spines best developed.

This statement does not, of course, exclude the possibility of smaller specimens being also well provided with spines: if it did it could never be allowed to pass by one who had gone over the collection in the British Museum. Inasmuch as it tacitly allows that small specimens may be well provided with spines on the dorsal aspect of the disk, it raises the next question as to whether that difference is one of race, of sex, or of an indefinite variability, not yet seized upon to the profit of the species. In other words, it raises questions which are beyond the ken of the cabinet naturalist, but not questions which cannot be satisfactorily investigated by those who are fortunate enough, as are some of our Australian fellow-subjects, to have these creatures living in their own seas.

One will perhaps be pardoned the apparent truism if attention is directed to the fact that while a systematist measures spines by millimetres, a Starfish may have them scattered in great abundance over his whole body—in other words, accurate measurements must always be used in an intelligent fashion, note being made of the fact that a difference in length which, when measured by the ruler, may amount only to  $\frac{1}{2}$  a millimetre, comes to be a matter of importance to a creature which numbers these spines by hundreds.

In the investigation of the spinulation of Starfishes there is, surely, a wide field for the study of those mechanical causes with which the zoologist is concerned.

*OREASTER GRAYI*, sp. nov.

*Pentaceros nodosa*, Gray, Ann. N. H. vi. p. 277 (1841).

As we use Linnæus's name *nodosus* for the species which he no doubt so first named, we have to find another name for Gray's species.

The following description is based on a specimen considerably larger than Gray's "type," which was obtained from Billiton:—

R=2.2r. Disk not high; arms very broad, even at the distal end; lophial ossicles with large tubercles in the place of more or less sharp spines; the apical spines not disproportionately large. A few spines within the apical region.

The superomarginal plates alone form the sides of the arm, they are about 17 in number; the inferomarginals are more numerous by one or two; of the former, some of the more distal are provided

with rounded tubercles very similar to those which are found on the lophial line; there are no spines of any sort on the inferomarginals.

The spines of the adambulacral plates in the dried specimen have been for the most part lost, as have also the granules on the ventral plates. In the "type" the inner row has five not particularly delicate spines; those of the next row form a pretty stout pair, and outside these there is a set of smaller and more irregularly disposed spines. The ventral plates, which are distinct from one another, are covered by large granules, among which may be discerned a fair number of valvular pedicellariæ of various sizes.

On comparing the smaller and the larger specimen (which give respectively the following admeasurements— $R=52, 76$ ;  $r=23, 31$ ; breadth of arm at base  $23.5, 36.5$ ) we see that the leading differences between them are—(1) the smaller sometimes has spines on the inferomarginal plates, which themselves take some share in forming the sides of the arms; (2) the number of marginal plates is smaller; and (3) nearly all the superomarginals carry nodose spines or tubercles.

We have therefore in this species a growth-character which differs from that which ordinarily obtains in this genus; but it is one which can be explained by reference to the small size and rare distribution of the poriferous area, coupled with the considerable size and resisting power of the ossicles of which the skeleton is here composed.

#### OREASTER ORIENTALIS.

*Oreaster orientalis*, M. Tr. p. 128.

Three dried specimens of this species, the first representatives of it in the British Museum, have recently been acquired from the Chinese Court in the late Fisheries Exhibition, and I am able therefore to give an independent description of a species which has never been mentioned since the time of Müller and Troschel.

A triplacanthid form, with a high disk and the general habit of *O. reticulatus*, but with dorsal spines much less well developed and ventral spines altogether absent.

$R=2.5 r$ . Disk elevated; arms narrow at their base, slender in portion to the disk. Lophial line well marked, but spines not long; apical spines prominent, a few short spines within the apical region.

From about 20 to 25 marginal plates, the boundaries between which are not always as well marked as in most species of the genus; both sets take part in forming the sides of the arm; in the angles of the arm both sets bear spines, rather short and sharp; further out the spines are smaller and less regularly developed; they are, however, absent from the upper, and generally present on the distal lower plates. Adambulacral spinulation triplacanthid; eight (nine *testibus* Müller & Troschel) delicate short spines in the innermost row, each set separated by a forcipiform pedicellaria; five much stouter in the middle, and two to four in the outermost row. With advance in size the boundaries between the ventral plates become obscured; the granules are closely packed and large, but always remain flat, and never become produced into spinous processes;

valvular pedicellariæ are, on the other hand, pretty numerous, and are especially rich along the sides of the ambulacra. The marginal plates are very regularly granulated, and small valvular pedicellariæ are not unfrequently developed. The granulation on the upper surface is more delicate. The pore-areæ are very regular, triangular, and of moderate size; at the nodal points spines or spinous tubercles are always developed; and we have here one of the rare cases of the development of dorsal without ventral spines.

Colour (dry) more or less white.

Measurements:—

R .....	133	115	110
r .....	52	37 <sup>1</sup>	42
Greatest breadth of arm....	35	24	25

*Hab.* China (Swatow).

*OREASTER TROSCHELI*, sp. nov.

A triplacanthid form, most nearly allied to *O. orientalis*, but distinguished from it by the following characters:—There are not more than three spines in the second row of adambulacral spines on each plate; the spines are, as a rule, developed only on the distal marginal plates, and those that do not carry spines bear a number of valvular pedicellariæ.

$R=3r$ . Disk not elevated; arms distinct, not wide at their base, and tapering very gradually. A median dorsal row of fairly well-developed spines; the five apical spines very strong; most of the angles of the poriferous areæ on the disk are provided with spines; there are no spines on the ventral plates.

About 25 superomarginal and 27 inferomarginal plates; the latter are confined to the abactinal aspect, save at the end of the arm. The superomarginals are very high in the angles, but are shorter along the sides of the arms; in exceptional cases a spine or two may be developed on them in the proximal, but, as a rule, they are confined to the distal half of the arm. They are often well developed sharp processes. Owing to the position of the terminal superomarginals, the two last spines are set quite on the abactinal surface. The spines on the inferomarginals are rare and small; but these, as well as the non-spinose superomarginals, are richly provided with pedicellariæ.

Adambulacral spines in three rows; the innermost delicate, short, about ten in number; in the middle row there are two or three stout spines, and in the outermost two or three, not quite so regularly developed as the rest. The immediate buccal armature is formed by the elongation and strengthening of the spines of the lowest row. The ventral ossicles are fairly distinct from one another, and are very richly provided with pedicellariæ. A considerable number of pedicellariæ are likewise developed on the abactinal aspect of the disk and arms; like all those in this species, they are sessile and valvular.

The pore-areæ are large and numerous, so that the reticulation of

<sup>1</sup> Shrunk in drying.

the dorsal ossicles is very well marked; three rows of pore-areas extend along the greater part of each side of the arm. Madreporic body rather obscure, small, irregularly oval, surrounded by an impressed line. Granules cover all the plates, are small and regular, save on the ventral plates, where they are larger and more irregular.

Colour (in alcohol) yellowish white.

$R=140$  millim.;  $r=47$  millim.

*Hab.* Billiton.

I have dedicated this species to the memory of the late Professor Troschel, who, with Johannes Müller, was the author of the 'System der Asteriden.'

*OREASTER MUELLERI*, sp. nov.

A triplacanthid form allied to *O. orientalis*, but distinguished from it by the following characters:—There are only two or three, and not as many as five, spines in the second adambulacral row; nearly all the marginal plates, whether superior or inferior, carry spines; the pedicellariæ on the ventral plates are not numerous.

$R=2.5 r$ . Disk rather high; arms rather wide at their base, and stout for all their distance; spines at the sides half or more than half as high as those of the median row, the apical spines well developed. Spines richly developed on the disk. No spines on the ventral plates.

About twenty marginal plates in either series, the lower completely confined to the abactinal aspect, save just at the end of the arm. The superomarginals considerably excavated superiorly, so that their upper edge is triangular; the spines on the upper are more prominent than those on the lower plates, and are developed on nearly all; those on the inferomarginals are occasionally double. There are no pedicellariæ on the marginal plates.

Adambulacral spines in three rows; in the innermost eight delicate spines, of which the outer in each set are remarkably small; each set is separated from its neighbour by a forcipiform pedicellaria; in the middle row two, sometimes three, much stouter spines; in the outermost row two or three, not quite as stout; these spines decrease in number on the distal plates. The immediate buccal armature appears to be formed by the elongation of the spines of the lowest row. The ventral plates are best distinguished from one another by the large size of some of the tubercles on each plate; of these there may be four or more, which may form a rosette. A fairly large number of valvular pedicellariæ are developed, especially in the neighbourhood of the ambulacra.

The pore-areas are large and numerous, when of a definite form triangular, but at the sides of the arm the reticulation of the skeleton is not as distinct as it is on the disk.

Madreporic body irregular in form. Granules unequal, forming a mosaic, never reaching to the tips of the spines. Pedicellariæ on the dorsal surface small, forcipiform.

Colour (in alcohol) creamy white.

$R=98$ ;  $r=38$ ; breadth of arm at base 34.

*Hab.* Billiton.

## OREASTER.

*Species incertæ.*

From the island of Mauritius (through M. de Robillard) came two specimens of a brick-red colour, which have at first sight a very close resemblance to *O. reticulatus*; further investigation, however, not only shows that the species are distinct from that form (though neither of them are *O. affinis*), but also, and this is the curious point, striking as is their general resemblance to one another, they do not belong to the same species.

Species  $\alpha$ .—Adambulacral spinulation triplacanthid, the spines in the middle row remarkably strong, two on each plate; superomarginal plates about 16, but only the distal plates with well-developed spines; spines developed on the rather more numerous inferomarginals, without any marked irregularity, but they are never so long, or so strong, or so sharp as in *O. reticulatus*. Granules on the ventral plates coarse and large, sometimes, but rarely, forming short spines. Dorsal surface and general form not unlike that of *O. reticulatus*.

Species  $\beta$ .—Adambulacral spinulation diplacanthid, and always two outer spines for each plate: about 16 superomarginal and inferomarginal plates; the latter with fairly developed spines in the angles of the arm; the former occasionally with small spines at the angles, but with spines only well developed quite at the distal end. The numerous spines developed among the granules of the ventral plates are not so strong, and are far less regularly arranged than in *O. reticulatus*.

Complete accounts of these two species must be based on fuller material, and especially on specimens preserved in spirit. In addition to these two species there is yet another from Mauritius, which is represented by two badly preserved specimens; this third species, which likewise appears to be new, has the general form of *O. lincki*, but has lateral rows of spines not unlike those that are found in *O. dorsatus*.

Just as I had come to the conclusion to issue the incomplete notices of these apparently new species, I received a copy of the first part of the 'Catalogue Raisonné', which I owe to the kindness of its accomplished author. In the second part of that essay, soon no doubt to be published, we shall probably obtain some more information as to these forms.

## OREASTER CARINATUS.

*Oreaster carinatus*, M. Tr. p. 49.

A diplacanthid form with a well-marked lophial ridge and tubercles on both series of marginal plates and on the ventral plates; it seems to stand nearest *O. productus* (n. sp.), but our information with regard to it is very slight.

<sup>1</sup> "Catal. Rais. des Échinodermes recueillis par M. V. de Robillard à l'île Maurice," par P. de Loriol (Mém. Soc. Phys. Genève, xxviii. no. 8).

## 2. Description d'une espèce nouvelle de Gerbilline d'Arabie (*Meriones longifrons*). Par FERNAND LATASTE, C.M.Z.S.

[Received February 8, 1884.]

(Plates VI. & VII.)

### I. INTRODUCTION.

En 1882, vingt-quatre individus vivants de cette espèce, recueillis à Djeddah (Arabie), ont été envoyés, par M. le lieutenant Paget, au Jardin de la Société Zoologique de Londres, où ils vivent et se reproduisent depuis lors. J'en ai obtenu un premier couple le 5 juillet 1883, et six autres sujets (4 ♂ et 2 ♀) le 13 novembre de la même année; et, comme ils se sont multipliés chez moi, j'ai eu plus de matériaux qu'il n'était nécessaire pour entreprendre l'étude systématique de leur espèce.

Celle-ci, au Jardin Zoologique, a été inscrite jusqu'à ce jour sous le nom de *Gerbillus erythrurus* Gray<sup>1</sup>. Ses caractères profonds, bien plus que son facies extérieur, la placent en effet très-près d'*erythrurus*; mais, comme il ressort de l'étude comparative à laquelle je me suis livré et dont les résultats sont consignés ici, elle en est distincte.

Ne pouvant l'identifier à aucune des espèces qui ont été décrites jusqu'à ce jour, je la désignerai sous le nom nouveau de *Meriones longifrons*<sup>2</sup>.

### II. PLACE DE L'ESPÈCE.

Avant de la décrire, je rappellerai que les deux noms génériques de *Gerbillus* Desmarest et *Meriones* Illiger ne peuvent plus être considérés comme synonymes<sup>3</sup>. Ils s'appliquent à deux genres différents, ayant pour types, le premier *Dipus gerbillus* Olivier, le deuxième *Mus tamaricinus* Pallas, et caractérisés, le premier par des molaires tuberculeuses à l'origine et à lobes rétrécis au milieu quand l'usure a effacé les tubercules, le deuxième par des molaires lamelleuses dès la naissance et à lobes losangiques dilatés au milieu. Le sous-genre *Tatera* Lataste, dont *Dipus indicus* Hardwicke est le type, établit le passage d'un genre à l'autre. Ses molaires, quand elles sont très-usées, et c'est ainsi qu'elles ont été figurées par Fr. Cuvier (Trans. Zool. Soc. 1841, ii. pl. 25. figs. 18 & 19) et par Blanford (Eastern Persia, 1870, ii. p. 63, fig. 3), diffèrent à peine de celles des *Meriones*; mais, quand elles sont jeunes, sans être aussi franchement tuberculeuses, elles se rapprochent beaucoup de celles des autres *Gerbillus*.

<sup>1</sup> Ann. Nat. Hist. 1842, x. p. 266.—J'ai recueilli cette espèce en Algérie. Je l'ai d'abord décrite sous le nom de *gatulus* ('Le Naturaliste,' 1<sup>er</sup> juin 1882, p. 83); puis, ayant obtenu, du British Museum, un sujet d'*erythrurus* Gray, j'ai reconnu l'identité spécifique des deux formes et relégué le nom de *gatulus* Lat. dans la synonymie de celui d'*erythrurus* Gray ('Le Naturaliste,' 1<sup>er</sup> juin 1882, p. 83, et 15 août 1882, p. 127).

<sup>2</sup> *Longifrons*, à cause de ses os frontaux allongés et rétrécis par rapport à ceux de *M. erythrurus*.

<sup>3</sup> Voir 'Le Naturaliste,' 15 août 1882, p. 127.



J. Smith

MERIONES LONGIFRONS.

J. Smith.

Harhart imp





J. Smit lith.

MERIONES SHAWI, ♀.

Hanhart imp.



Chacun de ces deux genres comprend plusieurs sous-genres. J'en ai admis trois dans le genre *Meriones*: *Rhombomys* Wagner, dont chaque incisive est parcourue par deux sillons longitudinaux, et qui a pour type *Meriones opimus* Lichtenstein; *Meriones*, dont les incisives n'ont qu'un seul sillon longitudinal et dont le pied ne présente d'autres tubercules que les 4 sous-articulaires des orteils; et *Psammomys* Cretschmar, dont les incisives sont lisses, dont le tarse est pourvu d'un tubercule arrondi, et qui a pour type *Psammomys obesus* Rüppell.

Les espèces *erythrurus* et *longifrons* appartiennent au genre et au sous-genre *Meriones*.

### III. DESCRIPTION.

Comme je l'ai dit plus haut, *Meriones longifrons* est, par ses caractères importants, c. a. d. par la structure de son crâne, très-voisin de *M. erythrurus*; mais, par ses caractères extérieurs, il ressemble bien davantage à *M. shawi* Duvernoy<sup>1</sup>; il lui ressemble tellement, qu'il est difficile, même à un œil exercé, de distinguer, à l'état vivant, des jeunes de même taille de ces deux espèces. C'est donc par rapport à *M. shawi* et à *M. erythrurus* que je vais décrire la nouvelle espèce.

Si, dans cette étude, je ne me sers que d'un petit nombre de sujets de chaque espèce, cela tient uniquement à ce que les beaucoup plus nombreux individus de chacune d'elles que j'ai eus entre les mains m'ayant paru fort semblables les uns aux autres, j'ai jugé inutile d'en sacrifier ou d'en conserver en collection un plus grand nombre. Voici d'ailleurs la liste de ceux qui m'ont servi:

#### M. SHAWI.

##### En alcool:

No. 2370. ♂ adulte; né à Bordeaux fin sept. 1883, sacrifié le 12 déc. même année, âgé de 2½ mois; petit-fils de ♂ tunisien et de ♀ algérienne, ses parents nés à Paris, chez moi.

No. 2384. ♀ jeune; née à Bordeaux, des mêmes parents, du 1 au 3 nov., sacrifiée le 18 déc. 1883, âgée de 1½ mois.

##### En peaux:

No. 1805. ♂ très-adulte; obtenu vivant du Muséum de Paris, sacrifié le 10 avril 1882; d'origine algérienne.

No. 2295. ♂ très-adulte; né à Paris, chez moi, le 5 déc. 1882, sacrifié le 7 nov. 1883, âgé de 11 mois; fils de ♂ tunisien et de ♀ algérienne.

No. 2297. ♀ très-adulte; sœur du précédent, née et sacrifiée aux mêmes dates.

No. 1949. Très-jeune ♂, né à Gênes, de parents tunisiens; obtenu vivant de M. le Marquis G. Doria.

#### Squelettes:

No. 1806. Même sujet que no. 1805.

<sup>1</sup> 'Notes et renseignements sur les animaux vertébrés de l'Algérie,' p. 22 et suiv., et pl. i. et ii. Voir aussi 'Le Naturaliste,' 15 juillet 1882, p. 107.

No. 2294. Même sujet que no. 2295.

No. 2296. Même sujet que no. 2297.

No. 1941. ♂ très-adulte; Tunis; obtenu en alcool de M. le Marquis G. Doria.

No. 1939. Jeune ♂; même provenance.

#### M. LONGIFRONS.

##### En alcool:

No. 2371. ♀ adulte; née à Paris, chez moi, le 27 août 1883, sacrifiée le 12 décembre de la même année, âgée de  $3\frac{1}{2}$  mois; a été mère le 10 novembre et a élevé sa portée; parents, originaires de Djeddab, obtenus du Jardin Zoologique de Londres.

No. 2385. Jeune ♀; née à Paris, chez moi, le 7 nov., sacrifiée le 18 déc. 1883, âgée de 41 jours; même provenance.

##### En peaux:

No. 2304. ♂ adulte, né à Paris le 27 juillet, sacrifié le 11 nov. 1883, âgé de  $3\frac{1}{2}$  mois; deux fois père; même provenance.

No. 2369. Jeune ♂, né à Paris le 7 nov., sacrifié le 13 déc. 1883, âgé de 33 jours.

##### Squelettes:

No. 2246. ♂ bien adulte, reçu vivant, le 5 juillet 1883, du Jardin Zoologique de Londres.

No. 2303. Même sujet que le no. 2304.

No. 2356. ♀ très-adulte; reçue le 5 juillet, du Jardin Zoologique de Londres; sacrifiée le 29 nov. 1883, après avoir élevé trois portées.

#### M. ERYTHRURUS.

##### En alcool:

No. 1943. ♂; Téhéran (Perse); recueilli et donné par M. le Marquis G. Doria.

##### En peaux:

No. 1561 (*gætulus* Lat.). ♀ adulte; Tilremt (entre Berrian et Laghouat, Sahara algérien); contenait 6 fœtus dans ses utérus.

No. 1915. Afghanistan; recueilli par le Cap. Hutton; obtenu du British Museum.

##### Squelettes:

No. 1560. Même sujet que no. 1561.

No. 1922. Même sujet que no. 1915.

No. 1557 (*gætulus* Lat.). Chotts tunisiens (expédition Roudaire).

Je vais procéder successivement à la comparaison des sujets en alcool, des sujets en peaux et des squelettes.

## A. Sujets en Alcool.

## a. Dimensions comparatives des trois espèces (en millimètres).

	<i>M. longifrons.</i>	<i>M. shawi.</i>	<i>M. shawi.</i>	<i>M. longifrons.</i>	<i>M. erythrurus.</i>
Numéros d'ordre.....	2385	2384	2370	2371	1943
Long. du corps (tête et tronc) ..	84	110	134	112	118
Long. de la queue avec ses poils	90	102	130	128	150
Long. de la queue nue.....	84	97	123	115	130
Long. de la tête .....	32	37	42	39	40
Hauteur max. de l'oreille (mesurée du côté convexe) ...	10	12	14.5	12.5	11
Distance du coin postérieur de l'œil au bord antérieur de l'oreille .....	5	5	6	7	8
Distance du coin antérieur de l'œil au bout du museau .....	14	16.5	20	17.5	17.5
Longueur de la jambe .....	28	33	42	36	40
Longueur du pied (ongles compris) .....	27	31	35	30	36.5

b. *M. longifrons* comparé à *M. shawi*.—D'une façon générale, *shawi* est plus volumineux et d'apparence plus massive, *longifrons* plus petit et plus dégaqué.

La queue de *shawi* est plus courte, celle de *longifrons* plus longue que le corps ; l'oreille du premier est un peu plus longue que le tiers de la tête, plus oblongue, plus rapprochée de l'œil ; celle du deuxième est plus courte que le tiers de la tête, plus élargie au dessus de sa base, plus écartée de l'œil.

La disposition des couleurs est la même chez les deux espèces ; seulement la teinte des faces supérieures est plus grise et plus pâle chez *longifrons*.

Le pied de *longifrons* est d'un demi centimètre plus court que celui de *shawi* ; en outre le partie glabre du tarse est plus étendue et blanche chez le premier, plus réduite et brune chez le dernier.

Tous ces caractères suffisent à faire distinguer sûrement les sujets adultes de l'une ou l'autre espèce ; mais pour les jeunes, dont le corps, la queue, les oreilles, le pied n'ont pas encore atteint leurs dimensions définitives et caractéristiques, dont la robe est assez semblable et dont le tarse a la même apparence, il sera nécessaire d'extraire et d'examiner leurs crânes pour les déterminer avec certitude.

J'ai trouvé, entre les deux espèces, dans la disposition de plis palatins, une petite différence que je signale ici, sans y attacher d'ailleurs une grande importance.

*M. longifrons*.—3 prémolaires continus, un peu concaves en arrière, presque transversaux ; le premier prolongé en avant en une forte saillie longitudinale. 5 paires d'intermolaires, d'ordinaire tous très-nets (nos. 2246 et 2303), parfois la 4<sup>me</sup> paire effacée (2316) ; ceux des 4 1<sup>res</sup> paires concaves et inclinés en arrière, ceux de la 5<sup>me</sup> presque transversaux ; la 1<sup>re</sup> paire commençant extérieurement

un peu en avant de la 1<sup>re</sup> molaire, la 5<sup>me</sup> paire en face de la 2<sup>me</sup> (2316) ou de la 3<sup>me</sup> (2246 et 2303) saillie de la 2<sup>me</sup> molaire. Surface postérieure lisse du palais limitée, au niveau de la dernière molaire, par une ligne transversale presque droite, un peu concave en arrière, avec un petit prolongement médian anguleux en avant.

*M. shawi*.—De même 3 prémolaires et 5 paires d'intermolaires ; mais ceux de la 5<sup>me</sup> paire relevés en avant (nos. 1937, 1939, 1945 et 1949). Une fois (no. 1941), j'ai observé un 6<sup>me</sup> pli supplémentaire, entre le 4<sup>me</sup> et le 5<sup>me</sup> du côté gauche.

c. *M. longifrons* comparé à *M. erythrurus*.—Ici la distinction est facile. Le pied d'*erythrurus* est aussi long et gros que celui de *shawi*, différant, sous ce rapport, autant que ce dernier, de celui de *longifrons* ; et nous trouverions d'autres différences, à la vérité plus délicates, dans les proportions du corps, de la queue et de l'oreille ; mais, pour distinguer les deux espèces, nous n'avons même pas besoin de recourir au compas ; il nous suffit de comparer leurs robes.

Les faces supérieures d'*erythrurus* sont jaune rougeâtres nuagées de brun, celles de *longifrons* son gris roussâtre pâle et relativement uniformes ; les pieds et les faces inférieures d'*erythrurus* sont jaune roussâtres ou tout au moins blanc jaunâtres, les mêmes parties de *longifrons* sont du blanc le plus pur ; les taches claires susoculaires et postauriculaires d'*erythrurus* sont effacées, celles de *longifrons* grandes et vives ; le poil blanc des faces inférieures d'*erythrurus* est ardoisé à la base, celui de *longifrons* est blanc dans toute sa longueur ; les ongles et la peau des pieds d'*erythrurus* sont bruns, ceux de *longifrons* sont blancs ou seulement colorés par le sang ; la queue d'*erythrurus* est hérissée de poils raides comme des soies et longs, celle de *longifrons* est revêtue de poils fins et courts qui laissent voir sa fine écaillure ; enfin la queue d'*erythrurus* est d'un roux rouge, tranchant avec la couleur beaucoup moins vive et plus brune du dos, celle de *longifrons* est sensiblement de même nuance que le dos ; enfin la touffe terminale brune est beaucoup plus longue et serrée chez *erythrurus*.

Même la variété *des sables*<sup>1</sup>, plus claire et à ventre blanc, d'*erythrurus*, se distinguera toujours aisément de *longifrons*, à son pied plus grand revêtu d'une peau brune et armé d'ongles bruns, aux poils de ses flancs et de sa poitrine ardoisés à la base, et à sa queue garnie de poils plus longs, plus raides, plus serrés et plus vivement colorée.

Les plis du palais de *M. erythrurus* (no. 1943) sont, comme chez les deux espèces précédentes, au nombre de 3 prémolaires et de 5 paires d'intermolaires ; et ceux de la 5<sup>e</sup> paire sont, comme chez *M. shawi*, relevés en avant. La limite de la surface postérieure lisse du palais, presque directement transversale dans son ensemble, n'en présente pas moins trois concavités très-ouvertes et tournées, la médiane en avant, les deux latérales en avant et un peu en dehors.

<sup>1</sup> 'Le Naturaliste,' loc. cit.

## B. Sujets en peaux.

La plupart des différences qui distinguent les peaux des trois espèces sont les mêmes que j'ai déjà notées sur les sujets en alcool :

a. *M. longifrons* comparé à *M. shawi*.—1. Différence de taille, mesurée par le pied. Le pied des trois *shawi* adultes (nos. 1805, 2295, et 2297) a la même longueur, 36 millim., tandis que celui de *longifrons* adulte n'a que 31 millim., soit, comme pour les sujets en alcool, un demi centimètre de différence. Le pied d'un très-jeune *shawi* (no. 1949) mesure 30 millim., et celui d'un très-jeune *longifrons* (no. 2369), seulement 25 millim.

2. Le tarse de *longifrons* est, en dessous, bien moins velu que celui de *shawi* ; la partie glabre est plus étendue, et, ailleurs, les poils sont plus rares et plus courts.

3. La peau nue du tarse est blanche chez *longifrons*, brune chez *shawi*.

4. Dans le pied de *longifrons* il n'y a que des poils blancs ; il y a des poils jaunes dans celui de *shawi*.

5. Les poils du bas des flancs sont entièrement blancs chez *longifrons* ; ils sont ardoisés à la base chez *shawi*.

6. Le poil de l'intérieur de l'oreille est exclusivement blanc chez *longifrons* ; il y a des poils roux dans l'oreille de *shawi*.

7. La couleur du dos est gris roux pâle chez *longifrons*, roux brune chez *shawi*.

Il n'est pas possible d'apprécier, sur des peaux, les différences de proportions des oreilles et de la queue.

b. *M. longifrons* comparé à *M. erythrurus*.—1. Différence de taille, appréciable par le pied. *M. erythrurus* a le pied de même longueur que *shawi* (*erythrurus* : no. 1561, 35 millim. ; no. 1915, 36 millim.), et bien plus grand que *longifrons*.

2. Les pieds d'*erythrurus*, au moins aussi velus que ceux de *shawi*, le sont bien moins que ceux de *longifrons*.

3. La peau des pieds et les ongles d'*erythrurus* sont bruns, ceux de *longifrons* blancs ou seulement colorés par le sang.

4. Les poils du pied d'*erythrurus* ont une teinte rousse ou jaune sale, déjà très-apparente en dessus, encore plus prononcée en dessous ; ceux de *longifrons* sont parfaitement blancs.

5. Chez *erythrurus*, non seulement les poils des flancs et du ventre sont ardoisés à la base, mais (sauf chez la variété *des sables*) leur couleur en masse est jaune ou jaunâtre sale, et la teinte foncée des faces supérieures passe graduellement à la teinte plus claire du dessous : chez *longifrons*, les poils des faces inférieures sont entièrement blancs, et celles-ci sont d'un blanc pur et nettement limitées sur les flancs.

6. Le poil de l'intérieur de l'oreille est exclusivement jaune chez *erythrurus*, exclusivement blanc chez *longifrons*.

7. *M. erythrurus* a, sur le dos, plus de brun que *shawi*, et, chez lui, les taches brunes contrastent davantage avec le fond roux jaunâtre de la robe : le dos de *longifrons* est gris roux pâle et relativement uniforme.

8. La queue d'*erythrurus* est d'un roux rouge, contrastant avec

la teinte relativement obscure du dos: le dos et la queue de *longifrons* ont la même nuance isabelle.

9. La queue d'*erythrurus* est très-velue, et son écaillure est entièrement masquée par les poils gros, longs et serrés: les poils de la queue de *longifrons* sont relativement courts, fins et rares, et ne

Fig. 1.

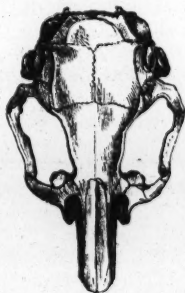
Crâne de *M. shawi* (no. 1806) en dessus.

Fig. 2.

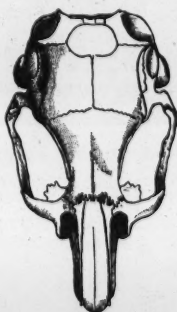


Fig. 3.

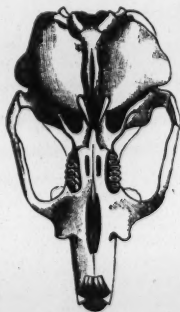
Fig. 2. Crâne d'un autre *M. shawi* (no. 2294) en dessus.

Fig. 3. Le même en dessous.

masquent pas son écaillure. Cette différence dans l'abondance, la rudesse et la longueur de poil est plus sensible encore à l'extrémité de cet organe.

C. *Squelettes.*

a. *M. longifrons* comparé à *M. shawi*.—Les crânes de ces deux espèces diffèrent trop pour qu'il soit utile d'en serrer la comparaison. Voici quelques caractères qui suffiront à les faire toujours distinguer :—

Chez *shawi*, la plus grande longueur des bulles auditives est inférieure à la longueur des os nasaux ; ces organes ne sont pas renflés dans la région antéro-supérieure du conduit auditif, et ils ne dépassent pas l'occipital en arrière ; les arcades zygomatiques sont très-massives et relativement écartées ; les crêtes pariétales et pariéto-occipitales sont très-saillantes. Chez *longifrons*, les bulles sont plus longues que les os nasaux, renflées en avant et au-dessus du conduit auditif et bien saillantes en arrière de l'occipital ; les arcades sont médiocrement massives et relativement rapprochées, les crêtes fines.

Je dois faire remarquer ici que tous les *shawi* n'ont pas le crâne aussi court et large que les deux sujets algériens, ♂ et ♀ (celle-ci, nos. 1828 et 1829 de ma collection, actuellement au *British Museum* ; l'autre, nos. 1805 et 1806), qui m'ont servi à décrire l'espèce<sup>1</sup>. Ceux-ci étaient exceptionnels sous ce rapport. Les crânes des sujets tunisiens que j'ai reçus de M. le Marquis Doria, et ceux des métis que j'ai obtenus d'un ♂ tunisien et d'une ♀ algérienne, ont des proportions plus semblables à celles des autres crânes de *Meriones*. Chez eux, l'écartement des arcades zygomatiques n'est plus supérieur à la distance qui sépare le bord postérieur des os nasaux de la limite postérieure de l'occipital ; mais les os nasaux sont toujours beaucoup plus longs que les bulles, et celles-ci restent relativement petites et triangulaires, les arcades lourdes et massives, les crêtes saillantes : caractères qui permettent de distinguer, au premier coup d'œil, cette espèce de toutes celles que j'ai eues entre les mains. Du reste voici quelques mesures, en millimètres, prises sur cinq crânes de *shawi* :

Numéros d'ordre .....	Adultes.				Jeune.
	1806	1941	2294	2296	1939
Longueur du crâne (depuis le bord antérieur des os nasaux) .....	42	44.5	44	44.5	37
Longueur des os nasaux .....	17	17.5	17.5	17	14
Distance de l'une à l'autre arcade (mesurée extérieurement).....	26.5	25	26	25	21
Diamètre maximum de la bulle .....	14	15.5	16	15.5	14.5

b. *M. longifrons* comparé à *M. erythrurus*.—Comme je l'ai déjà dit, les crânes de ces deux espèces sont très-voisins. Ils ne le sont

<sup>1</sup> 'Le Naturaliste,' 15 juillet 1882, p. 107.

Fig. 4.



Fig. 5.



Fig. 4. Crâne de *M. erythrurus* (no. 1557) en dessus.  
 Fig. 5. Le même en dessous.

Fig. 6.



Fig. 9.



Fig. 6. Crâne de *M. erythrurus* (no. 1557) de profil.  
 Fig. 9. Crâne de *M. longifrons* (no. 2246) de profil.

Fig. 7.



Fig. 8.



Fig. 7. Crâne de *M. longifrons* (no. 2246) en dessus.  
 Fig. 8. Le même en dessous.

pourtant pas davantage que ceux des *Dipodillus campestris* Levaillant et *simoni* Lataste, espèces d'ailleurs parfaitement distinctes ; et ils le sont certainement moins que ceux des *Microtus* Schranck (*Arvicola auctorum*), *arvalis* Pallas et *subterraneus* Sélys, espèces qui appartiennent à deux sous-genres différents, et qu'il est, dans certains cas, absolument impossible de distinguer à l'aide du crâne seul<sup>1</sup> ; je crois, en effet, avoir trouvé des caractères qui permettront toujours de séparer les crânes de *Meriones longifrons* de ceux de *M. erythrurus*.

Les crânes des deux espèces ont la même forme générale ; ils sont, l'un et l'autre, remarquables par le grand développement des bulles et le ballonnement du conduit auditif ; mais ces deux particularités sont plus accentuées chez *erythrurus*.

Si l'on regarde les bulles par dessous, leur contour horizontal commun, en avant des conduits auditifs, figure un arc de cercle continu chez *longifrons*, deux arcs latéraux raccordés par une longue ligne droite transversale chez *erythrurus*, cette différence tient à ce que les bulles du premier s'atténuent davantage vers leur extrémité antérieure. Le conduit auditif est sensiblement moins renflé en avant chez *longifrons* ; l'arcade zygomatique ne le touche pas, tandis qu'elle s'appuie sur lui chez *erythrurus*. Le renflement du conduit auditif se raccorde au restant de la bulle, en avant, par une dépression, étroite et relativement profonde chez *longifrons*, largement ouverte chez *erythrurus*. La partie triangulaire de la bulle qui se montre entre les branches du temporal et de l'occipital est arrondie, à peu près aussi haute que longue chez *longifrons*, très-sensiblement allongée d'avant en arrière chez *erythrurus*. Mais le caractère distinctif le plus net est fourni par la portion frontale du crâne, plus allongée et plus rétrécie en avant chez *longifrons* : la largeur minimum de cette région (mesurée en arrière des saillies lacrymales) est contenue deux fois chez *longifrons*, seulement une fois et demie chez *erythrurus*, dans sa longueur (mesurée le long de la suture interfrontale).

Voici quelques mesures fournies par des crânes de l'une et l'autre espèce :

Numéros d'ordre.....	<i>longifrons.</i>			<i>erythrurus.</i>		
	2246	2303	2356	1557	1560	1922
Longueur du crâne (depuis le bord antérieur des os nasaux) .....	37	37.5	36	41.5	40.5	38.5
Longueur des os nasaux .....	13	13	13	15	15	15
Longueur de la suture interfrontale	12	12	12	11.25	10	10.5
Largeur du front en arrière des saillies lacrymales .....	5.5	5.5	5.5	7.25	7.5	7
Diamètre maximum de la bulle...	16	16.5	15	18	17	16

<sup>1</sup> Voyez Humphrey P. Blackmore and Edw. R. Alston, "On Fossil Arvicolidæ," P. Z. S. 1874, p. 460.

Chez *longifrons* (no. 2246), la jambe est plus grande que le pied, le pied que le bassin; la cuisse est presque égale au bassin. Chez *erythrurus* (no. 1557), la jambe est plus grande que le pied, le pied à peine plus grand que le bassin; le bassin est plus grand que la cuisse.

#### IV. DIAGNOSES.

##### a. MERIONES SHAWI. (Plate VI.)

*Meriones*, supra late rufo-fuscus, subtus albus, pilis laterum basi cinereis; cauda corpore paulo minore, præter floccum colore dorsi, haud hirsuta; auricula vix tertiam partem capitis longitudine superante, pilis albis rufisque intus munita; longitudine pedis (cum unguibus) 35-36 millim.; tarso more villosa, pilis albis rufisque, area glabra fusca.

*Bulla ossea* longitudine maxima minore quam os nasale, pone haud prominente; antero-superiore parte ductus auris haud inflata; arcu zygomatico vulde crasso, dilatato, a bullis distante; cranii cristis fortioribus.

##### b. MERIONES LONGIFRONS, sp. n. (Plate VII.)

*Meriones*, supra pallide griseo-rufus, subtus, pilis totis albis, niveus; cauda corpore vix longiore, præter floccum colore dorsi, haud hirsuta; auricula fere tertiam partem capitis longitudine æquante, pilis tantum albis intus munita; longitudine pedis (cum unguibus) 30-31 millim., tarso parum breviterque villosa, pilis tantum albis, area glabra maxima, haud fuscata.

*Bulla ossea* valde longiore quam nasale, pone valde prominente; ductu auris ante et supra inflato; arcu zygomatico mediocri, ductum auris haud attingens; cranii cristis tenuibus; frontis longitudine bis latitudinem minimam æquante.

##### c. MERIONES ERYTHRURUS Gray.

*Meriones*, supra rufo-flavo fuscoque nebulose mixtis, subtus sordide rufescente vel flavesciente albus, pilis laterum basi cinereis; cauda corpore longiore, rutilo-rufa, hirsuta; auricula tertia parte capitis longitudine minore, pilis tantum rufis intus munita; longitudine pedis (cum unguibus) 35-36.5 millim.; tarso more villosa, pilis sordide rufis vel flavis, area glabra unguibusque fuscis.

*Bulla ossea* valde longiore quam ossum nasale, pone valde prominente; ductu auris ante et supra inflato; arcu zygomatico mediocri, ductui auris admoto; cranii cristis tenuibus; frontis longitudine vix sesquialterum latitudinis minimæ æquante.

#### V. OBSERVATION.

*Meriones crassus* Sundevall<sup>1</sup> est certainement très-voisin de *M. longifrons* et de *M. erythrurus*; il a un crâne construit sur le

<sup>1</sup> K. Vet. Ak. Handl. lxiii. p. 234 (1842), pl. ii. fig. 4 (skull).

même type que le leur, et remarquable par un semblable gonflement des bulles et du conduit auditif; mais il diffère :

1. De *M. longifrons* : par sa taille plus considérable et sa queue bien plus courte que le corps, "*longitudo . . . circa 140 millim. + cauda præter pilos 88.*" par sa queue couverte de poils longs, serrés, grossiers, et raides, "*cauda crassa, pilis densis, non brevibus, sat crassis et rigidis,*" et ornée d'une tache blanche dans sa touffe terminale, "*ipse vero apex habet penicillum brevem, album, a pilis nigris obtectum;*" et par les poils de ses flancs cendrés à la base, "*vellere quoque laterum basi cinereo.*"

2. De *M. erythrurus* : par sa queue bien plus courte que le corps, de même couleur que lui, "*cauda . . . colore corporis,*" et ornée d'une tache blanche dans sa touffe terminale; par la petitesse, "*planta c. u. 32,*" et la blancheur de son pied, "*pedes albi;*" par sa couleur pâle en dessus, "*pallide fulvescens,*" et blanche en dessous, "*vellus gastræi totum album;*" et par ses oreilles blanchâtres, "*aures pallidæ.*"

Il se pourrait à la rigueur que l'exemplaire unique, un vieux mâle, qui a servi à la description de Sundevall fut un sujet, aberrant et à queue mutilée, soit de *M. longifrons*, soit de la variété *des sables* de *M. erythrurus*; mais il me paraît plus vraisemblable que *M. crassus* est une troisième espèce du même groupe; et c'est cette manière de voir que j'adopterai jusqu'à ce que l'examen du type de Sundevall, conservé sans doute, ait permis de trancher péremptoirement la question.

*M. crassus* a été trouvé dans le désert de Sinai, au nord de la presqu'île arabique vers le milieu de laquelle a été recueilli *M. longifrons*, et au milieu de l'aire considérable occupée par *M. erythrurus*. Celui-ci a été rapporté d'Algérie (Lataste), de Tunisie (expédition Rouadaire), de Perse (Marquis G. Doria) et d'Afghanistan (Capt. Hutton). *M. shawi* n'est encore connu que d'Algérie et de Tunisie.

## VI. ETHOLOGIE.

N'ayant pas observé vivant *M. erythrurus*, il ne sera plus question ici que des deux autres espèces.

### a. Extrait du Journal de *Meriones shawi*.

1881, 1<sup>er</sup> nov.—Un premier couple, originaire de la province des Constantine (Algérie), né ou conservé à la ménagerie du Muséum de Paris, m'est donné par M. le Prof. A. Milne-Edwards.

1882, 28 janv.—Naissance de 3 petits, qui ne sont pas élevés.

10 avr.—Je sacrifie le ♂ (nos. 1805 et 1806 de ma collection).

24 avr.—Je sacrifie la ♀ (nos. 1828 et 1829, envoyés au British Museum)<sup>1</sup>.

<sup>1</sup> Dans ma note "Sur le bouchon vaginal des Rongeurs" (Journ. de l'Anatom. et de la Physiol. 1883), j'ai donné, sur la mode d'accouplement de cette espèce, des détails qui m'ont été fournis par l'observation de ce couple et que je ne reproduis pas ici.

31 juill.—Je reçois de M. le Marquis G. Doria, dir. du Musée civ. de Gênes, deux ♀, l'une avec 3 petits qu'elle allaite. Ceux-ci sont manifestement rachitiques.

4 août.—Sacrifié la ♀ non nourrice (nos. 1945 et 1946, actuellement au Musée de St. Pétersbourg).

5 août.—Sacrifié l'un des jeunes, le plus rachitique (nos. 1949 et 1950).

14 oct.—Pendant une absence, le plus petit des autres est mort.

10 nov.—Donné au Mus. de Paris la mère, qui meurt aussitôt après, ostéomalacique. Il ne me reste plus que le jeune ♂.

Reçu du Mus. de Paris une nouvelle ♀, d'origine algérienne. Je la réunit au ♂ tunisien. Il est déformé par le rachitisme; elle est petite, a mauvais poil, et paraît également malade. Je leur donne du pain phosphaté et des coquilles d'œufs. Ils font bon ménage.

29 nov.—Depuis plusieurs jours, ♂ et ♀ travaillant activement à leur nid.

5 déc.—Vers 1<sup>h</sup> de l'après-midi, naissance de 3 petits. Le ♂ couche dans le nid à côté d'eux et de la mère. Quand on veut saisir celle-ci, elle fuit, et les petits, fixés aux tétines, sont entraînés; ils se détachent les uns après les autres et jonchent le sol. J'ai souvent observé le même fait sur des Rats et des Souris. Z. Gerbe a cru que les femelles de Campagnols, inquiétées dans leur nid, transportaient ainsi, et de propos délibéré, leur progéniture vers un lieu plus sûr<sup>1</sup>; mais il a mal interprété un fait exact: j'ai toujours vu les rongeurs se servir exclusivement de leur bouche pour transporter leurs petits d'un endroit à l'autre; ils les saisissent par la peau du dos, et ceux-ci, même grands, se laissent faire.

7 déc.—Hier soir, la ♀ avait le vagin largement et profondément ouvert, arrondi, comme s'il venait de laisser tomber un bouchon.

10 déc.—Depuis plusieurs jours les petits, roses et nus à la naissance, ont bruni sur le dos. Quand ils vagissent, on dirait le chant d'une Mésange. L'orifice du nid est toujours fermé quand les parents sont dehors.

12 déc.—Les petits sont toujours bruns sur le dos. A la loupe on aperçoit les pontes brunes des poils. Il y a 1 ♂ et 2 ♀.

14 déc.—Les petits commencent à roussir.

16 déc.—Depuis quelques temps le ♂ poursuit vivement la ♀. Voilà 11 jours qu'elle a mis bas. La période du rythme de l'ovaire serait-elle aussi, chez cette espèce comme chez *Mus musculus* et *Dipodillus simoni*, d'une décade environ?

19 déc.—Actuellement le ♂ couche seul, à l'extrémité opposée du nid; souvent la ♀ lui cherche querelle et le bat.

23 déc.—Les petits ouvrent les yeux; ils ont 18 jours.

27 déc.—Ils ont le poil, la couleur, la forme de leurs parents, dont ils ne diffèrent plus que par la taille. Ils sont très-vifs, courant, sautant même beaucoup plus et mieux que les adultes.

30 déc.—Je réunis, dans une même cage, une jeune ♀ *Meriones shawi* à un jeune ♂ *Mus decumanus albinus*. Elle a 25 jours; lui,

<sup>1</sup> Z. Gerbe, 'Mélanges Zoologiques,' p. 103, art. *Arvicola incertus*.

34. Ils paraissent vivre en bonne intelligence. ♀ *shawi* est bien plus petite et plus faible, mais aussi plus vive et plus entreprenante. D'abord ils faisaient lit à part; mais au bout de deux jours je les trouve installés côté-à-côté dans le même nid.

1883, 4 janv.—Donné à M. Ch. Mailles, à Paris, les deux autres jeunes *shawi*, ♂ et ♀.

5 janv.—Envoyé la jeune ♀ *shawi*, avec son camarade *M. decumanus*, à M. G. Perboyre, à Cadillac (Gironde).

Il ne me reste donc plus que la couple adulte.

6 janv.—Ce matin, j'ai laissé la ♀ seule dans sa cage, et j'ai réuni, dans une autre cage, le ♂ avec un ♂ *Mus decumanus* également adulte; les deux ne se battent point. Ce soir, en rentrant, je m'aperçois que la ♀ a ramassé, en un gros nid, le foin et la fougère qui garnissaient sa cage, et je trouve 5 petits au milieu. Il y a 32 jours (3 décades) qu'a eu lieu sa précédente portée.

Je ne laisse plus cohabiter ♂ et ♀ *shawi*. Sans réussir à être témoin de leur accouplement et à recueillir leur bouchon vaginal, je les présente l'un à l'autre les 7, 8, 9, 10, et 11 janvier. Quand il sont chacun dans sa cage (j'ai dû séparer ♂ *shawi* et ♂ *Mus decumanus* qui se querellaient), ils produisent fréquemment, avec leurs membres postérieurs, le bruit de tambour que j'ai déjà noté chez *Pachyromys duprasi*, ainsi que chez *Dipus aegyptius* et *hirtipes*: *tatata-tatata-tatata*, ou *tatera-tatera-tatera*.

25 janv.—Ce matin les jeunes ont les yeux ouverts et se promènent: ils ont 19 jours.

Du 25 janv. au 10 févr., c'est sans succès que je présente chaque jour le ♂ à la ♀: toutes les avances qu'il fait sont repoussées.

31 janv.—Donné, à Paris, un des jeunes, ♂, dont j'apprends la mort quelques jours après.

3 févr.—Envoyé deux autres jeunes, ♂ et ♀, à M. le Dr. Souverbie, directeur du Musée de Bordeaux. Donné les deux derniers, également ♂ et ♀, à M. Feuz, à Paris. Il ne me reste donc plus que la couple adulte.

10 févr.—Ayant pris la ♀ à la main, quand je la dépose, en la retenant doucement par la queue, elle a comme une petite attaque d'épilepsie; celle-ci, d'ailleurs, ne dure qu'un instant.

27 mars.—J'envoie la ♀ à M. le Marquis G. Doria, directeur du Musée civique de Gènes, et le ♂ à M. O. Schmidt, directeur du Musée de Strasbourg; sans avoir pu être témoin d'un accouplement fécond, ni recueillir un bouchon vaginal de cette espèce.

(Des trois couples nés chez moi aucun ne reproduisant, le ♂ du Musée de Bordeaux fut confié, par M. Souverbie, à M. Perboyre, et réuni à la ♀ de Cadillac. Celle-ci eut bientôt après une portée qu'elle n'éleva pas; puis, de nouveau pleine (ses utérus contenaient 7 foetus), elle fut tuée par le ♂. Alors ce ♂ fut rapporté à Bordeaux et de nouveau réuni à la ♀ avec laquelle il avait été élevé et qu'il n'avait pu précédemment féconder. Cette fois, il en obtint une première portée, fin 7 septembre, de 7 petits; une deuxième, du 1 au 3 novembre, de 5 petits, et un troisième, le 21 janvier, de 6 petits: tous ces jeunes ont été ou sont élevés.

En revanche, à Paris, MM. Ch. Mailles et Feuz firent, sans succès, l'échange de leurs mâles.)

29 août.—Je rentre en possession d'un couple du *shawi*, composé : du ♂ (désormais ♂ A), né le 5 déc. 1882, que j'avais donné à M. Mailles ; et de la ♀ (désormais ♀ B), née le 6 janv. 1883, que j'avais donnée à M. Feuz.

17 oct.—Ma ménagerie s'augmente d'un nouveau couple, jeune, né fin sept., du couple donné à Bordeaux.

22 oct.—J'expédie au Jardin Zoologique de Londres ♀ B, qui ne paraît par vouloir reproduire, et je rentre en possession de la ♀ (désormais ♀ C), née le 5 déc. 1882, que j'avais donnée à M. Mailles. Cette ♀ ayant précédemment tué le ♂ auquel elle avait été réunie, il ne reste plus en France, de tous les *shawi* que j'ai eus ou élevés, que le couple du Musée de Bordeaux et les miens.

Après quelques difficultés au début, ♂ A et ♀ C se mettent d'accord.

23 oct.—Je reçois du Musée de Bordeaux deux autres jeunes *shawi*, de la même portée que les deux premiers. Tous les quatre, et cinq jeunes *Dip. simoni*, sont installés dans une seule cage et font bon ménage. Il est vrai que les *shawi* sont bien petits encore : à les voir, on disait des *simoni* de grande taille. Il est à remarquer qu'à cet âge les *shawi* aiment beaucoup le petit grain (chènevis, millet, alpiste), tandis qu'adultes ils y touchent à peine, préférant de beaucoup le pain, la salade et les carottes.

25 oct.—♀ C a la singulière manie de gratter avec ses pattes et avec ses incisives le verre de sa cage, produisant ainsi un grincement assez désagréable, qu'elle fait durer longtemps et renouvelle souvent.

27 oct.—Ayant en l'idée de mettre, dans la cage du couple adulte, trois jeunes *simoni*, en leur donnant pour nid une boîte à orifice trop étroit pour les *shawi*, ceux-ci, d'abord, paraissent d'inquiéter assez peu des nouveaux venus ; mais ils les massacrent tous dans la nuit, les surprenant sans doute quand ils sortent pour se nourrir.

Les *shawi* urinent assez abondamment ; ils communiquent à leur cage une légère odeur de fauve, qui s'aigrit quelquefois et devient alors beaucoup plus désagréable.

4 nov.—Les 4 jeunes d'allongent à vue d'œil. La croissance de cette espèce est cependant bien plus toute que celle de *M. longifrons* : âgés d'environ un mois et demi, ils n'ont pas encore la moitié de leur taille, tandis qu'à deux mois les *longifrons* ont à peu près toute la leur et sont en état de s'accoupler. Ils mangent avec voracité les coques d'œufs. A cet âge encore ils ne vivent guère que de petits grains et de salade, touchant assez peu au pain.

6 nov.—Envoyé un des jeunes, ♂, à M. le prof. Nitsche, à Tharandt.

7 nov.—Le couple adulte ne reproduisant pas, je le sacrifie (♂ A, nos. 2294 et 2295 ; ♀ C, nos. 2296 et 2297). Il ne reste plus en France, des *shawi* nés chez moi, que le couple de Bordeaux, et, chez moi, que trois produits de ce couple.

19 nov.—Les jeunes commencent à battre des pieds et à faire *tatera*.

20 nov.—Je reçois de Bordeaux 5 nouveaux jeunes, nés, du 1<sup>er</sup> au 3<sup>me</sup> nov., des mêmes parents que mes autres. J'en envoie aussitôt un couple à M. G. Olive, à Marseille.

29 nov.—Les trois aînés sont superbes, les mâles bien sexués. Ils sont très-doux et très-maniables. Souvent j'entends leurs *tatera*. Ils mangent une quantité considérable de salade.

Je réunis, dans une même cage, les trois plus jeunes à une portée de *longifrons* à peu près de même âge. Les deux espèces s'accordent fort bien.

12 déc.—Je sacrifie un ♂ des trois plus anciens (no. 2370, depuis envoyé au Musée de St. Pétersbourg). Les deux autres de même âge s'appelleront dorénavant ♀ D, ♂ E.

18 déc.—Je sacrifie un des trois plus jeunes, ♀ (no. 2384; depuis envoyé au Musée de St. Pétersbourg); les deux autres sont ♂ et ♀.

1884, 29 janv.—Le couple ♀ D ♂ E est devenu superbe. Il a augmenté de taille et de poids jusqu'à ce jour, et il a 4 mois; les deux plus jeunes, âgés aujourd'hui de près de 3 mois, ont encore à faire pour acquérir cette taille. Je ne note plus les *tatera* que j'entends très-fréquemment dans les cages, pas plus que les tentatives d'accouplement que j'aperçois.

1 févr.—Je sacrifie ♂ E (no. 2475). En mourrant, par étouffement, il laisse échapper la matière d'un gros bouchon vaginal, qui se concrète aussitôt au bout du gland et dans l'extrémité de l'urèthre.

13 févr.—J'expédie ♀ D au Jardin Zoologique de Londres, afin qu'elle pose pour la Planche VII de ce travail.

#### b. Extrait du Journal de *Meriones longifrons*.

1883, 5 juill.—Je reçois un premier couple, ♂ A, ♀ B, du Jardin Zoologique de Londres, où il est né le 9 mai: il n'est donc pas encore âgé de deux mois. Aussitôt réunis dans une même cage, le ♂ poursuit la ♀, qui se défend. Querelle sans gravité.

6 juill.—Ce matin, je les trouve bons amis. A l'entrée de la nuit, l'un d'eux fait entendre des *tatera* assez forts et prolongés. Après dîner je les vois s'accoupler. Le ♂ reste quelques instants sur la ♀; il s'y agite très-fort, et sa queue bat le sol. Ce manège dure depuis plus d'une bonne heure; plusieurs fois j'ai examiné la ♀; son vagin s'est de plus en plus élargi et humecté, mais il ne m'a pas encore montré de bouchon. Vers minuit, le couple est tranquille depuis longtemps, et le vagin de la ♀ est encore vide: je cesse mon observation.

16 juill.—Ce soir, le ♂ joue du tambour. Il y a juste 10 jours que la ♀ était en rut. J'examine celle-ci: son vagin est intact.

27 juill.—Ce matin, vers 9<sup>h</sup>, la ♀ a fait un petit; à midi, j'en compte 3. La mousse du nid a été bien arrangée autour et au dessus des petits. Ce soir j'entends la ♀ jouer du tambour, et je vois le ♂ qui la poursuit. La ♀ ne montre pourtant pas encore de bouchon vaginal.

1<sup>er</sup> août.—A l'inverse des jeunes *Mer. shawi* et *Dip. simoni*, les

jeunes *longifrons* se montrent silencieux : du moins je ne les ai pas encore entendus crier.

6 août.—Les petits se développent à vue d'œil. Ils sont gras et luisants, toujours silencieux. Le poil est poussé en dessus, et il est coloré comme celui de l'adulte. Les yeux et les oreilles ne sont pas encore ouverts.

8 août.—Parmis les 3 jeunes il y a 2 ♂ et 1 ♀.

10 août.—Les petits sont fort beaux : leurs yeux sont dessinés comme s'ils allaient s'ouvrir. Un d'eux, pris à la main, fait entendre un petit cri de rongeur en allaitement : c'est la première fois que j'entends leur voix. Le couple absorbe une coquille d'œuf par jour, sans en rien gaspiller ; il s'attaque en outre à une coquille de Seiche suspendue dans sa cage.

11 août.—Les petits ouvrent les yeux ce soir : ils ont 15 jours.

15 août.—Depuis un jour ou deux, les petits sortent et se promènent.

26 août.—Je laisse la ♀, qui est manifestement pleine, seule dans sa cage, et je place dans une autre le ♂ avec les 3 jeunes.

27 août.—Ce matin la ♂ a mis bas 6 petits en parfaite santé. Il y a 31 jours qu'elle a mis bas précédemment : 3 décades, comme pour *Dip. simoni*, *Mus musculus*, etc. Cette fois, les petits crient autant que ceux de *Mer. shawi* et *Dip. simoni*.

28 août.—Hier sois j'ai réuni ♂ et ♀ dans la cage à bouchons<sup>1</sup> et, au bout d'une ou deux heures, j'ai recueilli un bouchon vaginal, petit et mal formé. Ce matin je sacrifie le ♂ (no. 2246). C'est une boule de graisse. Il présente, comme *Mer. shawi*, une grande glande sébacée au niveau de l'ombilic.

29 août.—Donné un couple de la première portée à M. Feuz, à Paris. J'appelle ♂ C leur troisième frère, que je garde.

3 sept.—À l'inverse de *Mer. shawi*, et semblablement à *Pach. duprasi* et *Dip. simoni*, c'est le petit grain, chènevis, millet, alpiste, qui a les préférences de *Mer. longifrons*.

4 sept.—*Mer. shawi* jouant du tambour, la mère *longifrons* lui répond, de l'autre bout de la chambre.

17 oct.—Au retour d'une absence de Paris, j'apprends que les jeunes ont ouvert les yeux le 13 sept., soit au 17<sup>me</sup> jour, deux jours plus tard que la portée précédente. Un des 6 petits a été en partie dévoré par sa mère vers l'âge de 15 jours ; les autres sont bien venus. Depuis quelque temps déjà ils sont séparés de leur mère.

♂ C et ♀ B cohabitent depuis deux jours. Elle n'avait pas été fécondée le 2 août, et elle avait depuis été privée du mâle ; lui, il a deux mois et demi, et il est plus gros et plus lourd qu'elle. Ce soir, les voyant se poursuivre, je les transporte dans la cage à bouchons ; et, au bout d'une demi heure environ, je recueille un très-gros bouchon vaginal. Vers 10 h., ♂ C se tenant depuis longtemps tranquille, et ♀ B laissant apercevoir dans son vagin l'extrémité d'un deuxième bouchon, je les sépare.

<sup>1</sup> Cage dont le plancher est formé par une toile métallique assez lâche pour que le bouchon puisse la traverser : aussitôt dégagé du vagin, celui-ci tombe au dessous de la cage et se trouve soustrait à la dent du ♂ ou de la ♀.

18 oct.—Je donne 3 des 5 jeunes de la dernière portée : 1 ♂ au Muséum de Paris ; 1 ♂ à M. Souverbie, directeur du Musée de Bordeaux ; et 1 ♀ à M. G. Perboyre, à Caillac. Il ne me reste plus de l'espèce que le couple adulte et deux jeunes, tous deux femelles.

19 oct.—Hier soir seulement ♀ B m'a livré son deuxième bouchon. Il est moins gros que le précédent, mais bien plus gros et mieux formé que celui du 27 août. Il montre deux prolongements utérins très-nets, ce qui établit que l'espèce, comme *Pachyuromys*, a les deux utérus simplement accolés et débouchant séparément dans le vagin.

20 oct.—Depuis le départ de leurs frères, les deux jeunes ♀ jouent souvent du tambour et se poursuivent, comme si elles étaient ♂ et ♀. Hier soir surtout et tout à l'heure j'ai remarqué ces allures. Je transporte ♂ C dans leur cage. Il les poursuit et elles s'enfuient comme affolées. Je le retire. Plus tard, vers 8<sup>h</sup> 10', je réunis, dans la cage à bouchons, une des ♀ (dorénavant ♀ D) et ♂ C. Aussitôt il s'élance sur elle, et, du premier coup, il lui pose un bouchon. Il ne s'en accouple pas moins, de nouveau, sept fois de suite. Le coit est rapide et vite renouvelé, comme cela a lieu pour *Dip. simoni*. Après une courte interruption, pendant laquelle la ♀ joue du tambour, je compte encore 12 accouplements ou tentatives. Je retire un instant ♀ D et mets sa sœur à sa place ; mais celle-ci n'est pas en rut. Elle l'était sans doute hier, à en juger par l'état encore ouvert et turgescence de son vagin et par les allures qu'elle avait alors. Le ♂ fait le beau auprès d'elle, mais il perd sa peine, et elle paraît assez effarée. Je la retire, et je réunis de nouveau ♀ D à ♂ C. 1 accouplement. La ♀ fait tatera. Encore 1 accouplement. Le mâle fait souvent la toilette de son pénis, prenant le gland entre les deux mains et le nettoyant avec sa bouche. 2 accouplements. La ♀ fuit, le ♂ l'atteint ; alors elle se courbe et s'aplatit, comme je l'ai décrit pour *M. shawi*. La ♀ gazonille comme un oiseau. Elle se retourne vivement et caresse le ♂ chaque fois qu'il se retire. 1 accouplement. Le ♂ fait tatera. 2 accouplements. Tatera. 3 accouplements. Tatera-tatera. . . Tout ce qui précède a duré un quart d'heure. Voici maintenant un repos de 20 minutes. 3 accouplements. Le bouchon tombe et je le recueille : il est 8<sup>h</sup> 45'. Un nouvel accouplement, et, aussitôt, un nouveau bouchon apparaît dans le vagin. Le ♂ poursuit la ♀, qui fuit en criant, et je les sépare, laissant ♀ D passer la nuit dans la cage à bouchons.

Ainsi ♂ C s'est accouplé à ♀ B à l'âge de 81 jours ; et ♀ D s'est accouplée à ♂ C à l'âge de 53 jours, moins de 2 mois. Nous verrons que ces deux accouplements ont été féconds.

21 oct.—La jeune ♀ non fécondée, changée de cage, m'amuse beaucoup par la frayeur qu'elle éprouve à la vue d'une coquille de Seiche suspendue dans un angle. Fixant cet objet, blanc et rongé de façon à figurer un croissant, elle s'allonge, rampe, avance d'un pas et recule aussitôt brusquement. Elle met bien demi-heure à parcourir la distance qui la sépare de cet épouvantail, soit un peu moins de 60 centimètres, la longueur de la cage !

22 oct.—Je réunis à demeure ♂ C et ♀ D dans une grande cage occupée déjà par 4 jeunes *Dip. simoni*. Ceux-ci ont un nid ne communiquant avec l'extérieur que par un orifice trop étroit pour les *longifrons* ; et, en outre, je leur donne des briques creuses pour leur servir de refuge en cas de danger pressant.

23 oct.—Il est très-amusant de voir ♂ C et surtout ♀ D donner la chasse à leurs petits compagnons de captivité. D'ailleurs ils ne me paraissent pas leur faire grand mal quand ils les atteignent : ils les bousculent sans les mordre. Parfois ils courent rapidement autour et au travers de leur cage, faisant beaucoup de bruit, comme pour effrayer les *simoni* et les faire sortir de leurs retraites. D'autres fois ils font semblant de s'élancer sur eux et ne quittent pas la place. A chacune de ces démonstrations, les *simoni* crient comme si on les égorgeait, en ayant soin d'ailleurs de rester ou de se mettre à couvert. Et ils sont très-hardis, poussant l'audace jusqu'à s'introduire dans le nid des *longifrons* quand ceux-ci sont endormis.

27 oct.—♂ C et ♀ D font une telle guerre aux *simoni* partageant leur cage, que je dois séparer les deux espèces ; et je suis très-cruellement mordu, deux fois de suite, par ♂ C, que j'ai pris à la main comme d'habitude. Il ne veut pas lâcher prise, et j'ai peine à me retenir de l'écraser dans mes mains. Je me contente de lui pincer fortement les lèvres et le museau jusqu'à ce qu'il desserre les dents. Il a ensuite une face bouffie et ridicule, mais ne paraît nullement malade.

12 nov.—Aujourd'hui encore ♀ B fait tatera. Evidemment ce bruit est produit sous l'influence d'excitations de diverses sortes et n'est pas limité à l'expression du désir sexuel.

4 nov.—Dans le ménage ♂ C ♀ D, il y a souvent de petites querelles, d'ailleurs sans gravité. Les deux époux se dressent l'un contre l'autre, criant et gesticulant, comme je l'ai décrit pour *Pachyuromys*.

7 nov.—Vers midi ♀ B est occupée à mettre bas. Ce soir, je compte 4 petits, 2 ♂ et 2 ♀. Il y a aujourd'hui 21 jours que ♀ B a été fécondée.

A minuit seulement je réunis, dans la cage à bouchons, ♂ B à ♀ C. Il y a quelques tentatives d'accouplement, mais peu nombreuses. Au bout d'une heure environ, aucun bouchon vaginal n'ayant été évacué et n'apparaissant dans le vagin, je sépare les deux sujets. Evidemment le rut est plus fugace après la parturition qu'en tout autre temps. Chez mes *simoni*, la ♀ a toujours été fécondée après sa délivrance quand je la laissais cohabiter avec le ♂, tandis que je n'ai jamais pu obtenir sa fécondation en lui présentant le ♂ seulement à cette époque.

♂ C et ♀ D sont souvent occupés à retirer par un trou l'étope de leur nid pour la rapporter par un autre trou. Autrefois les deux trous, de diamètres différents, correspondaient l'un à leur nid, l'autre à celui des *Dip. simoni* ; mais, maintenant que la cloison de séparation a été enlevée, ces *longifrons* font un travail de Pénélope. Est-ce pour eux un simple jeu ? ou croient-ils réellement faire un travail

utile et grossir leur nid ? C'est un simple jeu, car je viens de voir le ♂ arracher l'étope et la rentrer par le même trou.

10 nov.—Aujourd'hui, au 21<sup>me</sup> jour de sa gestation, vers 11<sup>h</sup> de l'après midi, ♀ D est occupée à mettre bas. Ce soir, je compte 5 petits. Plus tard, de 7<sup>h</sup> à 9<sup>h</sup>, je vois ♂ C ♀ D s'accoupler. Ils se querellent ensuite.

11 nov.—Le ménage ♂ C ♀ D est constamment en guerre : ♀ D voudrait chasser son ♂ du nid ; constamment elle tire à elle et à ses petits toute l'étope. Je sacrifie ♂ C (nos. 2303 et 2304). Il ne me reste donc plus que les deux ♀, B et D, toutes deux mères et nourrices.

13 nov.—Je reçois, du Jardin Zoologique de Londres, 6 nouveaux sujets, 4 ♂ et 2 ♀. Aussitôt je sacrifie un ♂ (nos. 2316 et 2317, envoyé depuis au Musée de St. Pétersbourg), le seul des six sujets dont la queue soit intacte.

18 nov.—Je donne à M. Alfr. Morel, à Paris, un des autres ♂. Les 4 sujets restants font mauvais ménage ; les deux ♀ surtout se battent et se mettent la queue en sang.

19 nov.—Je donne à M. Ch. Mailles, à Paris, un ♂, et j'expédie à M. le Dr. Souverbie, à Bordeaux, une ♀, réduisant ainsi à un seul couple (désormais ♂ E et ♀ F) le nombre des sujets récemment reçus de Londres.

27 nov.—La portée de ♀ D ouvre aujourd'hui les yeux, au 17<sup>me</sup> jour. Celle de ♀ B, qui a ouvert les yeux au même âge, commence à sortir, au 20<sup>me</sup> jour.

Je sacrifie une ♀ de la portée de ♀ D (no. 2342), réduisant celle-ci à deux couples.

28 nov.—Les 4 petits de ♀ B sont retirés à leur mère et réunis, dans une cage commune, à 3 *M. shawi* de 4 à 7 jours seulement plus vieux qu'eux.

29 nov.—Tous les soirs, depuis le 24 courant, j'ai présenté sans succès ♀ B à ♂ E. Elle a des pellicules dans le vagin, ce qui est un signe de stérilité définitive ou passagère. Je la sacrifie (no. 2356).

12 déc.—Il faut y regarder de bien près, pour distinguer les *shawi* des *longifrons* en si bas âge ; on peut cependant reconnaître les premiers à leur taille un peu plus grande et à leur teinte un peu moins pâle.

5 déc.—J'expédie un jeune ♂ de ♀ D à M. le Prof. Nitsche, à Tharant (Saxe), et une jeune ♀ de la même mère à M. G. Perboyre, à Cadillac (la température ayant beaucoup baissé ce jour là, les deux sujets arrivent morts, de froid sans doute, à leurs destinations).

11 déc.—Je donne à M. Alf. Morel, à Paris, le 3<sup>me</sup> et avant dernier petit de ♀ D, une ♀.

♀ E est tout à fait apprivoisée. Chaque soir, vers 9<sup>h</sup>, elle saute et s'agite bruyamment dans sa cage pour appeler l'attention. Dès que j'ouvre sa cage, elle saute sur la main que je lui présente et grimpe sur mon bras et mon épaule. Je m'assieds, et elle descend sur ma table, en fait le tour, revient sur moi, descend par terre, se promène

à travers la chambre et revient me trouver. Elle semble rechercher mes caresses et me regarde avec intelligence quand je lui parle. Elle ne prend même pas le temps de faire sa toilette, le soir, avant se réclamer sa mise en liberté, et elle se présente le poil encore humide et collé par touffes. Si je veux la prendre avant son heure, elle fuit au fond de son nid, dès que j'ouvresacage ; et puis elle se laisse faire, mais comme à contre cœur. Au contraire, après 9<sup>h</sup> et pendant toute la soirée, si je l'oublie ou si je la rapporte dans sa cage, elle fait un vacarme d'enfer, soulevant sa mangeoire et la laissant retomber avec bruit, sautant et s'accrochant au couvercle de sa cage. Sauf chez des Surmulots et chez des Gerboises, je n'ai jamais observé, chez aucun rongeur, autant d'intelligence et de sociabilité.

12 déc.—Je sacrifie ♀ D (no. 2371 ; envoyé depuis au Musée de St. Pétersbourg) ; et j'envoie à M. G. Perboyre, à Cadillac, un des 4 petits de ♀ B, une ♀.

13 déc.—Je sacrifie le dernier petit de ♀ D, un ♂ (nos. 2368 et 2369).

Il ne me reste donc plus que trois autres petits de ♀ B, 1 ♂ et 2 ♀, lesquels partagent la cage de 3 jeunes *shawi* ; plus le couple adulte ♂ E ♀ F.

18 déc.—Je sacrifie encore une jeune ♀ de ♀ B (no. 2385 ; depuis envoyé au Musée de St. Pétersbourg).

31 déc.—Je divise dans deux cages mes jeunes *longifrons*, laissant le ♂ avec une ♀ *shawi* et la ♀ avec un ♂ *shawi*. Ces deux ménages, destinés à des essais d'hybridation, vivent en fort bons termes.

1884. 9 janv.—Du couple ♂ F ♀ E il naît 6 petits, qui, tous, sont élevés et se développent normalement.

En résumé, ayant reçu 8 *M. longifrons* vivants, j'ai pu distribuer 13 sujets vivants de cette espèce, en sacrifier 8 pour l'étude, et il m'en reste actuellement 10 vivants. 31—8=23 sujets, en 5 portées, sont nés et ont été élevés chez moi.

## VII. CONCLUSIONS.

Des documents ci-dessus il résulte que, d'une façon générale, les mœurs des deux espèces de *Meriones* étudiées ici se ressemblent beaucoup et ressemblent beaucoup à celles des autres Gerbillines<sup>1</sup>.

Entre *M. shawi* et *M. longifrons* je ne vois guère à noter que d'assez légères différences, concernant le port, la durée du développement et l'alimentation. A côté de *longifrons*, aux allures vives et légères, *shawi* paraît lourd ; celui-là se tient d'ordinaire rassemblé sur ses pattes fines, et a, jusqu'à un certain point, une apparence de Gerboise ou d'Oiseau, tandis que le gros corps de l'autre est allongé sur des membres qui semblent courts. *Longifrons* a presque toute sa

<sup>1</sup> Voir : "Le Boubieda (*Pach. duprasi*)," dans 'La Nature,' 22 juillet 1822, p. 113 ; "Sur l'acclim. et la domest. d'un petit Rongeur orig. des Hauts-plateaux alg.," dans 'Bull. Soc. d'accl.' 1883 ; "Sur le bouchon vaginal du *Pach. duprasi*," dans 'Zool. Anz.,' 15 et 22 mai 1882, pp. 225 et 258 ; et "Sur le bouchon vaginal des Rongeurs," dans 'Journ. de l'anat. et de la physiol.,' 1883.

taille et se trouve en état de se reproduire à deux mois<sup>1</sup>, tandis que *shawi* continue de croître jusqu'à trois et quatre mois. Enfin *longifrons*, comme les Gerbillines de petite taille et même comme les jeunes de l'autre espèce, aime beaucoup le millet, l'alpiste et les autres petits grains, tandis que *shawi*, adulte, donne ses préférences au pain et aux légumes.

En ce qui concerne particulièrement les fonctions de reproduction, les observations ci-dessus relatées :

1°. Ne contredisent en rien et confirment en partie les propositions que j'ai établies ailleurs sur l'existence très-générale, l'origine et le rôle du bouchon vaginal chez les Rongeurs<sup>2</sup>.

2°. Montrent, sur de nouveaux exemples, que, pour la durée de la gestation et pour la périodicité des époques auxquelles la femelle est susceptible d'être fécondée, les espèces de Gerbillines, et même de Muridés, ne diffèrent pas : chez toutes, la durée normale de la gestation étant, à un ou deux jours près, de deux décades, il peut néanmoins s'écouler une décade de plus entre deux parturitions successives, quand l'accouplement fécondateur a immédiatement suivi la première ; et, chez toutes également, la durée de la période du rythme de l'ovaire paraît être d'une décade environ<sup>3</sup>. Quant au mâle, une fois adulte, il est constamment apte à l'acte fécondateur.

#### EXPLICATION DES PLANCHES.

##### PLANCHE VI.

*Meriones longifrons*, sp. n., d'après un individu vivant au Jardin Zoologique de Londres.

##### PLANCHE VII.

*Meriones shawi*, d'après un individu (♀ D de mes notes), né à Bordeaux, fin septembre 1883, petit fils d'un ♂ tunisien et d'une ♀ algérienne, et vivant actuellement au Jardin Zoologique de Londres.  
Toutes les figures de grandeur naturelle.

<sup>1</sup> Comme *Dip. simoni*. Une femelle de cette espèce, née le 16 mai, 1883, a eu une première portée, de 5 petits, le 8 août 1883, soit à l'âge de 84 jours : elle avait donc été fécondée à l'âge de 63 ou 64 jours. Depuis lors elle a fait et élevé, sans discontinuer, une portée par mois.

<sup>2</sup> 'Journal de l'anatom. et de la physiol.' loc. cit.

<sup>3</sup> Loc. cit., Appendice E.—Les Campagnols se comportent sans doute, sous le rapport des fonctions génératrices, exactement comme les espèces des genres *Gerbillus*, *Meriones*, et *Mus* : du moins leur gestation est également de 20 jours. Quant au nombre des petits, il varie de un à quatre dans le sous-genre *Terricola* Fatio, qui n'a que 4 mamelles, et de trois à cinq et six dans les genres *Myodes* Pallas-Selys, et *Microtus* Schranck-Lataste, qui ont 8 mamelles comme les Gerbillines. Tous les Campagnols sont aptes à se reproduire à l'âge de 2 mois (Z. Gerbe, 'Mélanges Zoologiques,' p. 101, note 1, et p. 103, note 1).

3. Description of an Asiatic Species of the Neuropterous genus *Corydalis*. By J. WOOD-MASON.

[Received February 13, 1884.]

(Plate VIII.)

CORYDALIS ASIATICA, n. sp.

♂ ♀. Head and thorax above brown (? green in the living insects), symmetrically marked with black or dark brown. Antennæ simple and setaceous. Head with a pair of minute spinules on its disk just internal to the lateral pair of ocelli. Mandibles coal-black, with a shallow rounded emargination at the base on the inner side. Anterior tibiæ rather strongly S-curved. Abdomen brown, without brown or black marks. Wings all subhyaline, faintly washed with smoky, darker smoky at the anterior margin; the anterior pair devoid of pearly white specks, but presenting, especially near the principal vein, a few indistinct elongated discal blotches resembling dried splashes of muddy water.

♂. Much larger than the female. Mandibles greatly elongated, curved, crossed, and depressed, about twice as long as the head, having a minute rudimentary tooth near the apex on the inner side; the margination at their base on the inner side conspicuous. Anal appendages short and stout. Labrum invisible from above between the bases of the mandibles. Antennæ (broken)? rather longer than in the female.

♀. Mandibles only about as long as the head, 3-toothed on the inner side of their distal half. Labrum visible from above between the bases of the separated mandibles.

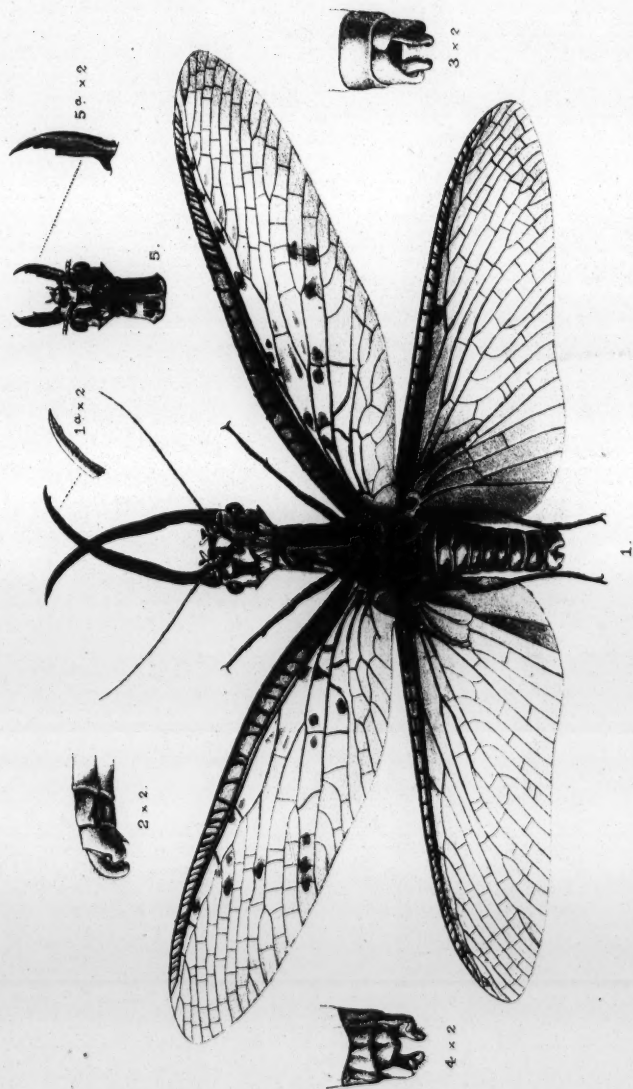
*Hab.* Naga Hills, N.E. frontier of India. The first specimen, a female, was obtained by Lt.-Col. H. H. Godwin-Austen; subsequently a male and a female were obtained by Messrs. Ogle and Chennell.

All the previously described species of this genus are American.

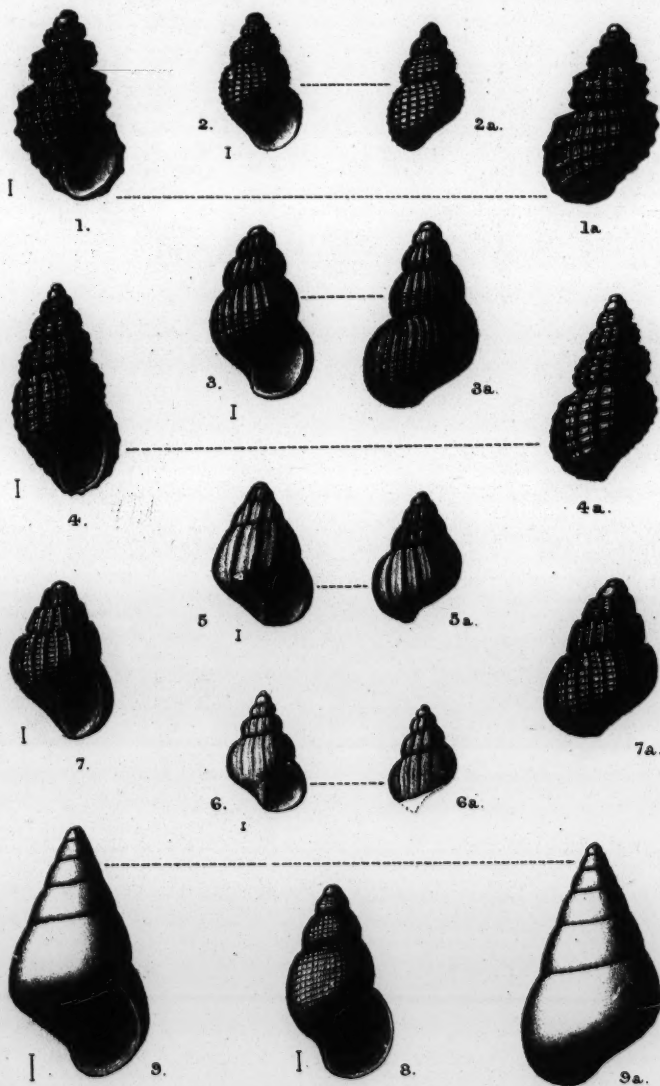
EXPLANATION OF PLATE VIII.

Fig. 1. *Corydalis asiatica*, ♂, of the natural size, with wings expanded.

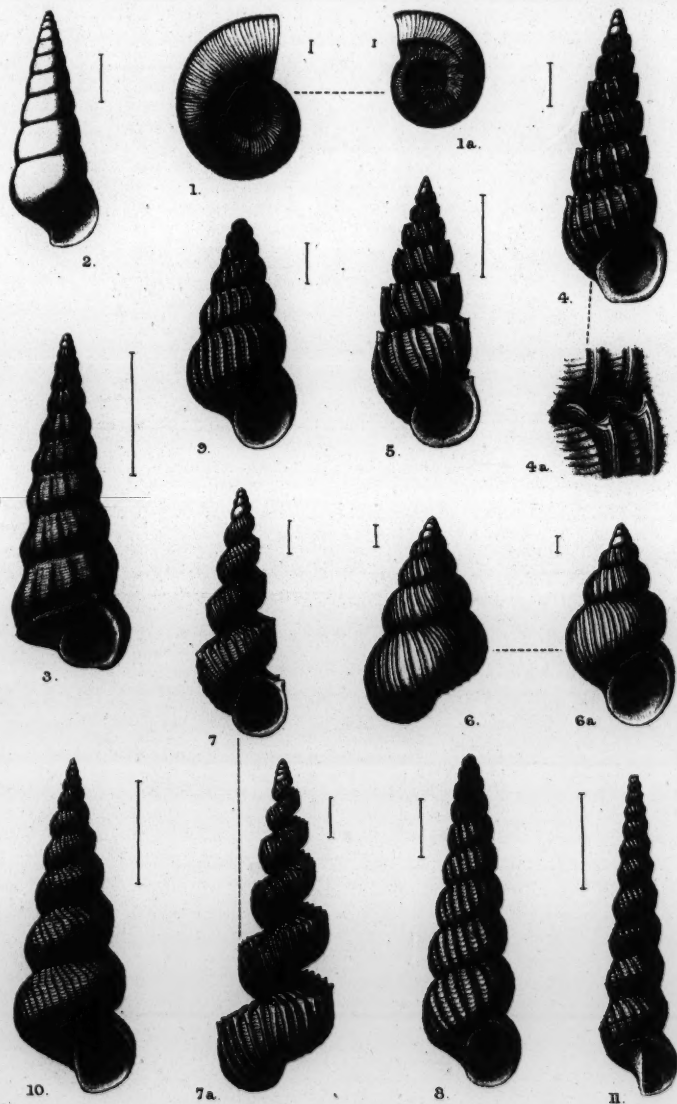
- 1 a. The apex of the left mandible,  $\times 2$ .
2. The extremity of the abdomen of the ♂, from the side,  $\times 2$ .
3. The same from above,  $\times 2$ .
4. The same from below,  $\times 2$ .
5. The head and prothorax of the ♀ from above, of the natural size.
- 5 a. The right mandible of the same,  $\times 2$ .



*Corydalid asiatica*.







C. Berjeau del et lith.

MOLLUSCA OF THE "LIGHTNING" AND  
"PORCUPINE" EXPEDITIONS.

Mintern Bros. imp.

4. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. (Part VII.) By J. GWYN JEFFREYS, LL.D., F.R.S., F.Z.S.

[Received February 19, 1884.]

(Plates IX. & X.)

GASTROPODA ; Family LITTORINIDÆ (continued).

RISSOA.

A. ALVANIA. Cancellated ; outer lip usually strengthened by a rib, and sometimes notched within.

1. RISSOA CANCELLATA, Da Costa.

*Turbo cancellatus*, Da Costa, Br. Conch. p. 104, pl. viii. f. 6, 9.

*R. cancellata*, B. C. iv. p. 8 ; v. p. 207, pl. lxvi. f. 3.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., 36, Tangier B. ; Med. Adventure Bank.

*Distribution.* Upper Norway (*McAndrew*) ! Stornoway to the Channel Isles, Atlantic coasts of France and Spain, Mediterranean, Adriatic, Mogador, Madeira, and Canaries ; 0-112 fms.

*Fossil.* Miocene : Modena, N.W. Germany, Bordeaux Basin, Madeira. Pliocene : Italy. Post-tertiary : Scotland, Ireland, and Selsea.

*Turbo cimez* of Donovan and older British authors (not of Linné), *R. crenulata* of Michaud, and other obsolete synonyms. Not *R. cancellata* of Desmarest, which is *R. cimez*.

2. RISSOA CALATHUS, Forbes and Hanley.

*R. calathus*, F. & H. British Mollusca, iii. p. 82, pl. lxxviii. f. 3 ; B. C. iv. p. 11 ; v. p. 207, pl. lxvi. f. 4.

'Porcupine' Exp. 1870 : Atl. St. 16, Tangier B. ; Med. Rasel Amoush.

*Distribution.* Drontheim and Bergen, Hebrides, Ireland and Isle of Man, Atlantic coasts of France and Spain, Mediterranean, Adriatic, Canaries (var. *manzoni*) ; 5-200 fms.

*Fossil.* Pliocene : Coralline Crag, Italy, Rhodes.

Allied to *Turbo acinus* of Brocchi and *R. venus* of d'Orbigny, both of which are Miocene species.

Young or immature specimens of the present species agree in every particular with Philippi's description and figure of his *R. reticulata* ; but that name had been preengaged by Montagu for the next species. It is somewhat variable in size and sculpture.

<sup>1</sup> For Part I. see P. Z. S. 1878, p. 393 ; for Part II. see P. Z. S. 1879, p. 553 ; for Part III. see P. Z. S. 1881, p. 693 ; for Part IV. see P. Z. S. 1881, p. 922 ; for Part V. see P. Z. S. 1882, p. 656 ; and for Part VI. see P. Z. S. 1883, p. 87.

3. *RISSOA RETICULATA*, Montagu.

*Turbo reticulatus*, Mont. Test. Brit. p. 322, t. 21. f. 1.

*R. reticulata*, B. C. iv. p. 12; v. p. 207, pl. lxvi. f. 5.

'Porcupine' Exp. 1870: Atl. St. 10, Vigo B., 36; Med. 55, G. Tunis, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Finmark to the Mediterranean and Adriatic, Canaries, (*McAndrew* and *Manzoni*); 7-300 fms.

*Fossil.* Miocene: Vienna Basin (as *R. mariae*). Pliocene: Coralline Crag, Italy, and Rhodes. Post-tertiary: W. Scotland.

*R. mariae* of d'Orbigny appears to be a variety of the present species, which is certainly *R. beanii* of Hanley and *R. textilis* of Philippi. Not *Alvania reticulata* of Philip Carpenter, which is a Pacific species.

4. *RISSOA CIMICOIDES*, Forbes.

*R. cimicoides*, Forb. in Rep. Br. Assoc. for 1843, p. 189: B. C. iv. p. 14; v. p. 207, pl. lxvi. f. 6.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: St. 6, 10, 14, 15, 25. 1870: Atl. 1, 2, 3, 9, Vigo B., 13, 16, 17a, Setubal B., off C. Sagres, 26-30, 36; Med. 45, Cartagena B., 50, 55, Benzert Road, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Hammerfest to the Mediterranean and Adriatic; 2-640 fms.

*Fossil.* Miocene: Central Italy (*Manzoni*), Madeira (*Mayer*). Pliocene: S.W. France, Italy. Post-tertiary: Norway, W. Scotland; 0-100 ft.

Some specimens are smaller than others from different localities, and have a shorter spire with coarser or finer sculpture. *R. sculpta* of Philippi corresponds with the former, and *R. intermedia* of Aradas with the latter; so that both may be the same species, as well as that of Forbes. The names given by Forbes and Philippi were published in 1844, that of Aradas in 1847.

5. *RISSOA JEFFREYSI*, Waller.

*R. jeffreysi*, Wall. in Ann. & Mag. N. H. ser. 3, xiv. p. 136: B. C. iv. p. 15; v. 207, pl. lxvi. f. 7.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: St. 16. 1870: Atl. 3, 3a, 12, 36.

*Distribution.* Varanger Fiord to Shetland, Gulf of Gascony, Bay of Biscay ('Travailleur' Exp. 1881), Straits of Messina (*Granata*), Algiers (coll. Weinkauff); 40-363 fms.

*Fossil.* Pliocene: Pezzo in Calabria (*Tiberi*)!, Messina (*Seguenza*)! Post-tertiary: Norway (*Crosskey* and *Robertson*)!; 30-100 ft.

*R. sororcula*, *Granata*, ex typo!

The late Mr. McAndrew showed me specimens of this and the last species which he had received from a correspondent in the United States as North-American; but this locality requires confirmation, as neither species has been recorded from it. The present species

differs from *R. scrobiculata* of Möller in being cancellated and in the peculiar sculpture of the apex.

6. *RISSOA DICTYOPHORA*, Philippi.

*R. dictyophora*, Ph. Moll. Sic. ii. p. 128, t. xxiii. f. 11.

'Porcupine' Exp. 1870: Med. St. Benzert Road, Adventure Bank.

*Distribution*. Mediterranean and Adriatic; 40-120 fms.

*Fossil*. Pliocene: Calabria.

A variety of this species is *Alvania weinkauffi* of Schwartz v. Mohrenstern.

7. *RISSOA FISCHERI*<sup>1</sup>, Jeffreys. (Plate IX. fig. 1.)

SHELL oval, rather solid, opaque and lustreless: *sculpture*, 16-18 strong longitudinal ribs on the last whorl, 14-16 on the penultimate, 10-12 on the next, and merely traces or none at all on the second whorl, the top whorl or apex being smooth; these ribs are crossed by equally strong spiral ribs or ridges, of which there are 6-8 on the last whorl, 4 on the penultimate, and 3 on the next whorl, the succeeding or second whorl being marked with a few spiral striæ; the points of intersection are noded or prickly, but only as to the four upper spiral ridges on the last whorl in consequence of the longitudinal ribs not extending to the lower or basal spiral ridges; the interstices are oblong: *colour* pale yellowish or dirty white: *spire* somewhat tapering: *whorls* 5, moderately convex, rapidly increasing in size, the last occupying half the spire; the apex is prominent but twisted: *suture* deep and angulated: *mouth* nearly round: *outer lip* thin, smooth inside: *inner lip* reflected on the pillar, which is not umbilicated nor perforated. L. 0.1, B. 0.05.

'Porcupine' Exp. 1870: Atl. St. 26, 36, Tangier B.

*Distribution*. Off Tunis (*Nares* and 'Shearwater' Exp.); 30-120 fms.

*R. calathus* is more slender, and has a longer spire and slighter suture. The present species is somewhat like *R. tenuicostata* of Seguenza (as described by Granata); but the sculpture is different. In the latter species it is finer, and there are fewer longitudinal and spiral ribs or striæ, viz. 4 spiral striæ on the last or body-whorl, and 2 on the penultimate and next whorls; *R. fischeri* is strongly and regularly cancellated, and it has 6-8 spiral striæ on the last whorl, and 3 or 4 on the penultimate and next whorls. *R. etneensis* of Aradas and Benoit is only half the size of the present species, and it has closer and more delicate sculpture. *R. fischeri* differs from *R. dictyophora* var. *weinkauffi* in the same respects as it does from *R. tenuicostata*, as well as in having a shorter spire and a proportionally larger body-whorl. It is also allied to *R. zetlandica*; but that species is of a more oblique shape, it has not the tuberos and cancellated sculpture of *R. fischeri*, the outer lip is expanded, and the spiral striæ at the base are fewer and stronger. *R. clathrata* is a larger

<sup>1</sup> Named in honour of Dr. Paul Fischer, whose conchological labours and especially his excellent 'Manuel de Conchyliologie' are so well known.

and stouter shell and has much coarser sculpture. Philippi's figure represents quite another species, and he describes the outer lip as thickened and grooved within.

8. *RISSOA LANCÆ*, Calcara.

*R. lancæ*, Calc. Moll. viv. e foss. Sicilia, 1845, p. 29, t. 4. f. 12.

*R. philippiana*, Jeffr. in Ann. & Mag. N. H. 1856, p. 182, pl. 11. f. 4, 5.

'Porcupine' Exp. 1870: Med. St. Algeciras B., Adventure Bank.

*Distribution.* Mediterranean and Adriatic; var. *Alvania tessellata*, (Schwartz v. Mohrenstern); Algiers (*Weinkauff*); 8-10 fms.

Although Calcara's description is too short and does not give all the characters, it sufficiently agrees with mine, and I therefore adopt his name, which is prior in date.

9. *RISSOA CANARIENSIS*, d'Orbigny.

*R. canariensis*, d'Orb. Moll. Can. 1837, p. 78, pl. vi. f. 5-7.

'Porcupine' Exp. 1870: Atl. St. 16. A single specimen.

*Distribution.* Mediterranean from the Gulf of Marseilles to Sicily, Canaries, and Madeira; 0-120 fms.

*Fossil.* Miocene: Madeira (*Mayer*).

10. *RISSOA PUNCTURA*, Montagu.

*Turbo punctura*, Mont. Test. Brit. p. 320, t. 12. f. 5.

*R. punctura*, B. C. iv. p. 17; v. p. 207, pl. lxxvi. f. 8.

'Porcupine' Exp. 1869: St. 18. 1870: Atl. 3a, Vigo B., 36, Tangier B. (var.); Med. 50, Adventure Bank. The Tangier specimens are smaller and slender, with more delicate sculpture.

*Distribution.* Finmark and Faroe Isles to the Mediterranean and Adriatic, Canaries (*McAndrew*); 0-130 fms.

*Fossil.* Pliocene: Coralline Crag, S.W. France, Italy, Rhodes. Post-tertiary: Scandinavia, Ayrshire, Portrush, Selsea; 0-100 ft.

There are some obscure and obsolete synonyms.

11. *RISSOA PARVULA*<sup>1</sup>, Jeffreys. (Plate IX. fig. 2.)

SHELL oblong, comparatively solid, semitransparent, nearly lustreless: *sculpture* consisting of about 20 longitudinal and somewhat curved riblets on the body-whorl, which are not continued much below the periphery; each of the two succeeding whorls has 14 to 16 similar riblets; all of these are crossed by spiral riblets or striæ, of which there are about 10 on the body-whorl and 4 to 6 on the penultimate and next whorls; the topmost whorl is encircled by microscopic lines; the intercrossing of the longitudinal and spiral riblets does not form tubercles or prickles at the points of junction; the interstices are square: *colour* pale yellowish: *spire* rather slender: *whorls* 4, slightly convex, the last occupying two thirds of the spire; *apex* blunt: *suture* distinct, but not deep: *mouth* more round than

<sup>1</sup> Very small.

oval: *outer lip* thin, smooth within: *inner lip* somewhat reflected and thickened on the lower part of the pillar, which is imperforate. L. 0.075, B. 0.045.

'Porcupine' Exp. 1870: Atl. St. Tangier B. Two specimens.

Differs from *R. punctura* in being more slender or narrower and of an oblong shape; and the sculpture is not reticulated.

12. *RISSOA SUBSOLUTA*, Aradas. (Plate IX. fig. 3.)

*R. subsoluta*, Ar. Mem. di Malac. Sic. iii. (1847), p. 21.

'Porcupine' Exp. 1870: Atl. St. 1, 3, 9, 13, 14, 16, 24, 26.

*Distribution*. Bay of Biscay ('Travailleur' Exp. 1880)!; Mediterranean (*Nares*, *Spratt*, *Monterosato*); 108-310 fms.

*Fossil*. Pliocene: Messina (*Seguenza*)!

In some specimens (as described by Aradas) the longitudinal striae partially disappear, or are entirely wanting, on the last and penultimate whorls.

The sculpture of this pretty little shell is much finer than that of the next species (*R. testæ*), and the spire is more bluntly pointed. I described it in my paper on Mediterranean Mollusca (Ann. & Mag. N. H. 1870) as the variety *obtusa* of that species under the name of *R. abyssicola*. At one time I considered the species named and described by Aradas the same as that which I now propose to call *deliciosa*, and which will be described and figured in this paper; but I have since been enabled to rectify the mistake by the examination of a typical specimen of *R. subsoluta*, which I received from the late Professor of Catania. The present species is *R. elegantissima* of Seguenza.

13. *RISSOA TESTÆ*, Aradas & Maggiore. (Plate IX. fig. 4.)

*R. testæ*, Ar. & Magg. Cat. rag. Catania, 1844, p. 207.

'Porcupine' Exp. 1869: St. 2, 3, 10, 16. 1870: Atl. 3a, Vigo B., Setubal B., 22, 24, off C. Sagres, 26-34, 36; Med. 40, 41, 45, Cartagena B., 50, Benzert Road, Adventure Bank, off Rinaldo's Chair. In most of the first-named Stations the variety *abyssicola* is the prevalent form. That variety is more oval, and has a rather more oblique spire and finer sculpture than the typical form; it is described and figured in the 'British Mollusca,' vol. iii. p. 86, pl. lviii. f. 1, 2, and (animal) pl. JJ. f. 3, and in 'British Conchology,' vol. iv. p. 19, and v. p. 207, pl. lxvi. f. 9.

*Distribution*. Typical form: Atlantic coasts of France and Spain to the Mediterranean and Adriatic; 11-640 fms. Var. *abyssicola*: Arctic, Norway to Mizen Head, Co. Cork; 30-300 fms.

*Fossil*. Typ. Pliocene: Italy. Var. *abyssicola*. Post-tertiary: Christiania district (*Crosskey* and *Robertson*).

In the above-cited paper on Mediterranean Mollusca I named the present species the variety *conformis* of *R. abyssicola*, not being then aware of the publication by Aradas and Maggiore. I afterwards received from the lamented Professor Aradas typical specimens of *R. testæ*, which not only confirmed my opinion that it was the

same as my variety of *R. abyssicola*, but also satisfied me that the latter was another variety of *R. testæ*, which is a much older name than *abyssicola*.

*Alvania asperula* of Brugnone appears to be the young.

B. FLEMINGIA. Ribbed lengthwise and spirally striated ;  
outer lip thickened and reflected.

14. RISSOA ZETLANDICA, Montagu.

*Turbo zetlandicus*, Mont., in Tr. Linn. Soc. xi. p. 194, t. xiii. f. 3.

*R. zetlandica*, B. C. iv. p. 20 ; v. p. 207, pl. lxxvii. f. 1.

'Lightning' Exp. : St. 2, 5.

'Porcupine' Exp. 1869 : St. 13, 14. 1870 : Atl. 2, 3, 13, 16, 17a, off C. Sagres, 27, 28 ; Med. Adventure Bank.

*Distribution*. Loffoden I. to the Mediterranean and Adriatic ; 12-200 fms.

*Fossil*. ? Miocene : Vienna Basin (*Hörnes*), Transylvania (*Hauer* and *Stache*), Modena (*Manzoni*). Pliocene : Coralline and Red Crag, Biot, and Italy. Post-tertiary : Norway (*Crosskey* and *Robertson*) ; 100 ft.

Among the synonyms are *R. carinata* of Aradas and *R. canaliculata* of Philippi. This species is probably not the *R. zetlandica* of Hörnes, which has a shorter spire and more tumid shape, with stronger and coarser sculpture ; *R. scalaris* of Dubois comes nearer to our species. *R. crispa* of Watson, from Madeira, is more closely allied to *R. zetlandica*.

15. RISSOA COSTATA, Adams.

*Turbo costatus*, Ad. in Tr. Linn. Soc. iii. p. 65, t. xiii. f. 13, 14.

*R. costata*, B. C. iv. p. 22 ; v. p. 207, pl. lxxviii. f. 2.

'Porcupine' Exp. 1870 ; Atl. St. Vigo B., 26, 36 ; Med. Adventure Bank.

*Distribution*. Norway, Sweden, Great Britain, and Holland to the Mediterranean and Adriatic, Canaries, and Madeira ; low water at spring-tides to 70 fms.

*Fossil*. Pliocene : Italy and Rhodes. Post-tertiary : Clyde Beds and Selsea.

The principal synonyms are *R. exigua* of Michaud and *R. carinata* of Philippi. Not *Turbo costatus* of Lamarck, which is *R. violacea*, nor *R. costata* of Desmarests, which is *R. variabilis* of v. Mühlfeld.

Mediterranean and Teneriffe specimens are smaller than northern specimens.

C. RISSOA. Mostly ribbed lengthwise and spirally striated ; outer lip usually strengthened by a rib.

16. RISSOA MONODONTA, Bivona.

*R. monodonta* (Biv.), Philippi, Moll. Sic. i. p. 151, t. x. f. 9.

'Porcupine' Exp. 1870 : Med. St. Algeciras B.

*Distribution.* Lisbon (*McAndrew*), Mediterranean and Adriatic; 4-18 fms.

*Fossil.* Pliocene: Central and Southern Italy. Post-tertiary: Rhodes and Cyprus.

In the shape and columellar fold this species is allied to the next.

#### 17. *RISSOA MEMBRANACEA*, Adams.

*Turbo membranaceus*, Ad. in Tr. Linn. Soc. v. p. 2, t. i. f. 12, 13.

*R. membranacea*, B. C. iv. p. 30; v. p. 208, pl. lxvii. f. 8.

'Porcupine' Exp. 1869: St. Donegal B. 1870: Atl. 26.

*Distribution.* Throughout the European seas from the Loffoden Isles southwards, Black Sea, the African coasts of the Mediterranean, and Canaries (*Schwartz*); 0-600 fms.

*Fossil.* Pliocene: Italy. Post-tertiary: Scandinavia, Scotland, Ireland, Selsea, Martigues, Rhodes; 0-100 ft.

The varieties and names of so-called species which I consider varieties are very numerous; I have noted more than a score of such synonyms. *R. splendida* of Eichwald appears to differ only in having a shorter spire and rows of small purplish spots, arranged in the same way as in a pretty Algerian variety of *R. montacuti*.

#### 18. *RISSOA VARIABILIS*, Megerle v. Mühlfeld.

*Turbo variabilis*, Meg. v. Mühlf. Ges. Nat. fr. zu Berlin, 1829, i. p. 212, t. i. (7), f. 9, a, b.

'Porcupine' Exp. 1870: Med. St. Algeciras B.

*Distribution.* Atlantic coasts of Spain and Portugal, Mediterranean, Adriatic, and Black Sea; 10-120 fms.

*Fossil.* Miocene: Madeira (*Mayer*). Pliocene: Italy. Post-tertiary: Nice, Leghorn, Sicily, Rhodes.

*R. costata* of Desmarests and *R. desmaresti* of Forbes. Monterosato says (in his letter) that perhaps *Eulima cingulata* of Reuquen may have been an elongated ribless variety of the present species. Such attempts at identifying doubtful species of obscure authors are more ingenious than useful.

*R. variabilis* deserves its name, as regards the length of spire and strength of sculpture.

#### 19. *RISSOA SIMILIS*, Scacchi.

*R. similis*, Sc. Cat. conch. Neap. 1836, p. 15; Phil. Moll. Sic. ii. p. 124, t. xxiii. f. 5. Var. as *R. costulata*, B. C. iv. p. 35; v. p. 208, pl. lviii. f. 1.

'Porcupine' Exp. 1870: Atl. St. Vigo B.

*Distribution.* From Scarborough and along the western coasts of France and Spain to the Mediterranean and Adriatic, Madeira and the Canaries; 0-150 fms.

*Fossil.* Miocene: Madeira. Pliocene: Italy. Post-tertiary: Selsea, Leghorn, Ischia, Rhodes, and Cyprus.

*R. costulata* of Alder and probably also *R. ovatella* of Forbes are varieties of *R. similis*; and there are several other synonyms. In my paper on Piedmontese Mollusca (nearly thirty years ago) I erroneously referred this species to *R. oblonga* of Desmarests; I now consider that so-called species a variety of *R. membranacea*. *R. costulata* of Risso appears to be the same species as *R. costata* of Desmarests, which is *R. variabilis* of v. Mühlfeld. But it would cause unnecessary confusion if these names were interchanged. Let usage prevail. "I care not for their names."

Specimens of *R. costulata*, Alder, from Cadiz, are undistinguishable from those of *R. similis* except in colour. The peculiar characters of both are the constriction of the body-whorl and mouth, and the spire tapering to a fine point. Some specimens of the typical form are ribless and nearly smooth, and others of the variety *costulata* are broader and more ventricose in the middle.

## 20. RISSOA VIOLACEA, Desmarests.

*R. violacea*, Desm. in Bull. sc. soc. phil. Paris, 1814, p. 8, pl. i. f. 7; B. C. iv. p. 33; v. p. 208, pl. lxvii. f. 9.

'Porcupine' Exp. 1870: Atl. St. Vigo B.; Med. Algeciras B., G. Tunis.

*Distribution*. Loffoden Isles to the Mediterranean and Adriatic, Black Sea, Madeira, and Canaries; 0-108 fms.

*Fossil*. Pliocene: Italy. Post-tertiary: Norway, Scotland and Ireland, Nice, Leghorn, Ischia, Rhodes; 0-100 ft.

At least ten synonyms, including *R. lilacina*, Recluz, *R. rufilabrum*, Leach apud Forbes and Hanley, *Persephone rufilabris*, Leach, and *R. porifera*, Lovén.

Variable as to size and the strength of sculpture, like all other littoral and prolific species.

## 21. RISSOA PARVA, Da Costa.

*Turbo parvus*, Da Costa, Brit. Conch. p. 104.

*R. parva*, B. C. iv. p. 23, pl. i. f. 1; v. p. 207, pl. lxvii. f. 3, 4.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 13, 36 (intermediate between the typical form and the variety *interrupta*), Gibraltar B. (monstr.). As var. *interrupta*, 1869: Donegal B., L. Swilly. 1870: Atl. Vigo B. (*semicostata*), 16; Med. Algeciras B. (*semicostata*), 50, Adventure Bank.

*Distribution*. Typical form and var. *interrupta*. Scandinavia from Vadsö southwards, Great Britain and Ireland, Heligoland, Holland, France, Spain, Portugal, Italy, Dalmatia, Greece, Algeria, Madeira, Canary Isles, and 'Valorous' and 'Travailleur' Expeditions; 0-1785 fms. (at great depths transported from the littoral and laminarian zones).

*Fossil*. Pliocene or Post-tertiary: Scandinavia, Great Britain and Ireland, Biot, Nice, Italy, Cos, and Rhodes; 0-200 ft. Not as *Turbo interruptus* of Adams from the Tertiary formation of N.W. Germany, described and figured by Philippi.

There are already too many names for this abundant and widely distributed little shell; but I fear that some of the modern species-makers will contrive to invent a few more to the great detriment and confusion of science. Quousque tandem abutentur patientiâ nostrâ?

22. *Rissoa angulata*<sup>1</sup>, Jeffreys. (Plate IX. fig. 5.)

SHELL forming a short and regular cone, thick, opaque, rather glossy: *sculpture*, 10-12 strong and slightly curved longitudinal ribs on each of the body- and penultimate whorls, those on the latter whorl being sometimes confluent or else some being much finer than the others; the ribs on the body-whorl are not continued below the periphery, which is distinctly angulated; there are no traces of spiral striæ; the upper whorls are quite smooth: *colour* yellowish brown or dirty white: *spire* short: *whorls* 4, compressed; the last occupies more than half of the spire; apex blunt: *suture* slight: *mouth* obtusely triangular: *outer lip* sharp, not crenated within: *inner lip* thickened: *pillar* imperforate. L. 0.075. B. 0.05.

'Porcupine' Exp. 1870: Med. St. Adventure Bank. Several specimens, apparently semifossilized or having the interior filled with small agglomerated fragments of a siliceous nature.

Differs from *R. ehrenbergi*, Philippi, according to his description and figure, in being more regularly conical, having 4 instead of 6 whorls and fewer ribs, and being destitute of spiral striæ.

23. *Rissoa albella*, Lovén.

*R. albella*, Lov. Ind. Moll. Scand., var. *sarsii*, p. 25: B. C. iv. p. 29; v. p. 207, pl. lxvii. f. 6.

'Porcupine' Exp. 1870: Med. St., Adventure Bank.

*Distribution*. Norway and Sweden, Kiel Bay, Shetland, Hebrides, Bantry Bay, Southampton, Dalmatia, and Southern Italy; laminarian zone.

*Fossil*. Post-tertiary: Christiania district, Uddevalla, Apulia, and Oreto in Sicily; 0-100 ft.

*R. cenonensis* of Brusina and *R. targionii* of Appellius, appear to be also varieties of the present rather variable species. The variety *sarsii* bears the same relation to the typical form as the var. *interrupta* has to *R. parva*; the principal difference between *R. albella* and *R. sarsii* consists in the latter having more convex whorls, and consequently a deeper suture, a slighter labial rib, and in the coloured markings.

I have satisfied myself that this is not the *Paludina benzi* of Aradas, judging from authentic specimens of that species. Nor do I consider it *R. ehrenbergii* of Philippi, which he found among seaweeds brought by Ehrenberg from Cattaro; it may have been a mistake as to the locality, as well as in other cases of Red-Sea shells, owing to the misplacement of tickets.

<sup>1</sup> Angular.

24. *RISSOA NANA*, Philippi.*R. pusilla*, Ph. Moll. Sic. i. p. 154, t. x. f. 13.*R. nana*, Id. op. cit. ii. p. 127.

'Porcupine' Exp. 1870: Med. St. 55, Adventure Bank.

*Distribution.* Coasts of Western France, the Mediterranean and Adriatic; 30-777 fms.*Fossil.* Miocene: Madeira. Pliocene: Monte Mario and Calabria. Post-tertiary: Rhodes.

The reason given by Philippi for changing the name which he originally proposed, viz. because Brocchi had previously given the name *pusillus* to a species of *Turbo*, was not satisfactory, inasmuch as Brocchi's shell belonged to *Rissoina* and not to *Rissoa*. This I have ascertained by an examination of Brocchi's specimens. But the change has been sanctioned and adopted by modern conchologists.

Not *R. nana* of Grateloup, which is a Miocene species of the Bordeaux Basin, nor *R. nana* (Partsch), Hörnes, from the Vienna Basin, both names being subsequent in date to that of Philippi. I greatly doubt the identification of the present species with *R. dolium* of Nyst, which name was substituted by him for *R. pusilla* of Marcel de Serres, also a fossil of the Bordeaux Basin. Possibly our species may be the *R. pulchra* of Forbes; but the size which he gives (one tenth of an inch) is far too great. Unfortunately the Ægean shells were dispersed, and many of them lost to science; his descriptions, or rather notices, were too short and insufficient for the exact comparison of his species, and very few of them were figured.

25. *RISSOA TURRICULA*<sup>1</sup>, Jeffreys. (Plate IX. fig. 6.)

*SHELL* turreted, thin, semitransparent, and somewhat glossy: *sculpture*, 20-25 slight and gently curved longitudinal ribs on the last whorl, and nearly as many, but finer, on the next whorl; the remainder of the shell is smooth; there are no spiral striæ or other markings: *colour* whitish: *spire* pointed: *whorls* 4, swollen, gradually increasing in size; apex slightly twisted on one side: *suture* deeply excavated: *mouth* roundish: *outer lip* sharp; inside smooth: *inner lip* reflected on the lower part of the pillar, behind which is a small chink. L. 0.05. B. 0.035.

'Porcupine' Exp. 1870: Atl. St. 3. Two specimens, not in good condition.

I propose this species with some hesitation, because the specimens have the appearance of being decorticated, like casts of a fossil shell; but I cannot identify them with any known species.

26. *RISSOA INCONSPICUA*, Alder.

*R. inconspicua*, Ald. in Ann. & Mag. N. H. xiii. p. 223, pl. viii. f. 6, 7: B. C. iv. p. 26; v. p. 207, pl. lxvii. f. 5.

'Porcupine' Exp. 1869: St. Donegal, B. 1870: Atl. Vigo B., 24, 26-30, 35, Tangier B.: Med. 50, Adventure Bank.

<sup>1</sup> A little bower.

*Distribution.* Arctic Norway southwards along the western coasts of Europe to the Ægean archipelago, Madeira (*Watson*), and Teneriffe in the Canary Isles (*McAndrew*); 0-120 fms.

*Fossil.* Pliocene: Norwich Crag, Italy. Post-tertiary: Norway and Sweden, Scotland and Ireland, Rhodes; 0-100 ft.

This may be the *Turbo albus* of Adams (Trans. Linn. Soc.) and *Turbo albulus* of Maton and Rackett, and if so, the first of those names would take precedence of any other; but they may be considered antiquated. *R. rudis*, *R. nana*, *R. radiata*, and *R. granulum* of Philippi were erroneously given by me in my paper on the Piedmontese Testacea as varieties of the present species; that, however, was nearly thirty years ago, and I have since seen all these species instead of the descriptions of them. Mörch united, but wrongly as I believe, *R. albella* and *R. sarsii* with *R. inconspicua* as varieties. The sculpture is excessively variable, as regards not only the number and comparative strength of the longitudinal and spiral striæ, but even their existence. Some specimens are marked with one or two varices or larger ribs. The variety *variegata* is peculiar, and has been made a distinct species by Schwartz v. Mohrenstern.

27. *RISSOA DELICIOSA*<sup>1</sup>, Jeffreys. (Plate IX. fig. 7.)

SHELL conic-oval, rather thick, semitransparent, and glossy: *sculpture*, short, sharp, and somewhat curved longitudinal ribs or striæ, of which there are from 16 to 20 on each of the three last whorls, the first and second whorls being smooth; these ribs or striæ do not extend below the periphery; they are crossed by more numerous spiral striæ or thread-like lines, the six lowermost being much stronger than the rest; this intercrossing, however, does not impart to the surface a reticulated appearance, because the longitudinal ribs are much thicker and less numerous than the spiral striæ: *colour* milk-white: *spire* short, bluntly pointed: whorls 5, convex, gradually enlarging; apex bulbous: *suture* deep: *mouth* more round than oval, angular above: *outer lip* simple and rather thin, but strengthened outside by a thickened rib: *inner lip* folded over the pillar and forming with the outer rib a continuous or complete peristome: *base* compressed or slightly concave, and having a narrow chink behind the pillar-lip. L. 0.075. B. 0.05.

*Var. multicostata.* Longitudinal ribs much more numerous, finer and straight; spiral striæ also more numerous, but slighter and less distinct except at the base. Some specimens have much more delicate and close-set sculpture than is shown in the figures; and in other specimens the sculpture almost disappears. The variety, if it can be properly considered distinct, is connected with the typical form by intermediate gradations. Species-makers would revel in this kind of manufacture.

'Porcupine' Exp. 1870: Atl. St. 9, 13, 16, 17, 17a, 24, off C. Sagres, 26-34, 36; Med. 50, Adventure Bank, 58.

<sup>1</sup> Delightful.

*Distribution.* Bay of Biscay ('Travailleur' Exp.), Mediterranean (same, 'Shearwater' and Italian Exps., Marion, and Nares); 120-1062 fms. What I regard as a variety was procured in the 'Challenger' Exp., off Palma in the Canaries, at a depth of 1125 fms.; it is rather larger, and the sculpture is stronger. I gladly take again this further opportunity of publicly acknowledging my obligation to the Rev. Robert Boog Watson, who has so patiently and carefully worked out the greater portion of the 'Challenger' Mollusca, for his courtesy in allowing me to compare them with the Mollusca which are the subject of the present and preceding papers.

*Fossil.* Pliocene: Messina (*Seguenza*).

28. *RISSOA MONTACUTI* (*montagui*), Payraudeau.

*R. montagui*, Payr. Moll. Cors. p. 111, t. v. f. 13, 14.

'Porcupine' Exp. 1870: Med. St. Algeciras B.

*Distribution.* Rochelle (*Dr. d'Orbigny*), Cadiz (*J. G. J.*), Gibraltar to the eastern coasts of the Mediterranean, Adriatic, Madeira (*Watson*); 0-40 fms.

*Fossil.* Miocene: Vienna and Bordeaux Basins, and Maine-et-Loire. Pliocene: Italy. Post-tertiary: Leghorn, Ischia, Rhodes.

Apparently *Alvania lineata* and other species of Risso; but his descriptions and figures are equally enigmatical and indeterminable. There are also nine or ten more synonyms for this species and its varieties including *R. aspera* of Philippi and *R. algeriana* of Monterosato.

I have ventured to slightly change the spelling of the specific name, for the reason which I gave in B. C. (iv. p. 229) as to *Natica montacuti*. It surely is desirable to adhere to the established rule that all names of species should be given in Latin, preferably to a merely Latinized form. I therefore, in Part V. of the present series of papers (p. 673), substituted *eccentros* for *excentrica*. The former is a classical word, and is found in all good lexicons and dictionaries; the other is neither classical nor found anywhere. I make this remark with all respect for the opinions of M. Crosse and Herr Weinkauff, who have criticized my alteration.

29. *RISSOA WYVILLE-THOMSONI*, Jeffreys.

"*R. weyville-thomsoni*" (Jeffr.), Friele in *Nyt Mag. f. Naturvid.* 1877 (separate copy), p. 3. It will be figured in the forthcoming publications of the Mollusca from the 'Vöringen' Expedition A, as well as in the Quarterly Journal of the Geological Society.

'Lightning' Exp. St. 1.

'Porcupine' Exp. 1869: St. 77 (560 fms.).

*Distribution.* 'Vöringen' Exp.; cold area; 488-510 fms.

*Fossil.* Post-tertiary: Bridlington (*Lamplugh*)!

This and the next species are umbilicated; and if this character were sufficient to warrant another section of the genus, the name *Punctulum* might be appropriate. Another species, also a Bridlington fossil, which I have named *R. subperforata*, has the same peculiarity.

Dr. Kobelt and M. Crosse have objected to the specific name *wyville-thomsoni* as contravening the laws of Linnean nomenclature. But the name is really one and single, although compound and apparently double. The patronymic name Thomson and many others in England are so very common that the bearers of it are obliged to annex the second baptismal name by way of distinction. My own name by the bye is also a case in point. Linné himself frequently used compound names for Testacea, viz.: *pes-pelecani*, *pes-lutræ*, *caput-serpentis*, *crista-galli*, *stercus-muscarum*, *Auris-Midæ*, *Auris-Judæ*, *Auris-Dianæ*, *Tectum-persicum*, *oculus-capri*, *cornu-militare*, and *Cornu-arietis*. Here are a dozen such instances of Linnean names.

30. *RISOA STEFANISI*<sup>1</sup>, Jeffreys.

*R. costulata*, S. Wood, Crag Moll. i. p. 106, t. xi. f. 12, a, b.

*R. stefanisi*, B. C. v. p. 208.

*Distribution.* Throughout the Mediterranean, in few localities and sparingly; 40–600 fms.

*Fossil.* Pliocene: Red and Coralline Crag, Belgian Crag, and Biot. I cannot agree with Monterosato that this is the same species as *Actæon pygmæa* of Grateloup, a Miocene fossil of the Bordeaux Basin, nor with Van den Broeck that it belongs to the *Pyramidellidæ*. The apex is not heterostrophe or sinistral, although intorted; the peristome is continuous; and the pillar has no tooth or fold, only a slight thickening.

When I suggested the name *stefanisi* instead of *costulata*, I was under the impression that Alder's name *costulata*, being older than that of Wood, must be preferred to the latter. But I now believe that Alder's species is merely a variety of *R. similis*, and that Risso's *R. costulata* may be identical with *R. variabilis* of v. Mühlfeld. In that case Wood's name might stand. However,

"Confusion's cure lives not  
In this confusion."—SHAKESPEARE.

D. *CINGULA*. Spirally striated or smooth; outer lip plain-edged.

31. *RISOA STRIATA*, Adams.

*Turbo striatus*, Ad. in Tr. Linn. Soc. iii. p. 66, t. xiii. f. 25, 26.

*R. striata*, B. C. iv. p. 37; v. p. 208, pl. lviii. f. 2.

'Lightning' Exp. St. 2, 4, 5.

'Porcupine' Exp. 1869: St. 19. 1870: Atl. Vigo B.

*Distribution.* From the arctic and northern seas in both hemispheres to the Ægean and Teneriffe on one side, and Little Gull Island in New York and Jamaica on the other side; 0–96 fms.

The American and arctic form is *Cingula aculeus*, Gould (1841) = *R. saxatilis*, Möller (1842) = *R. arctica*, Lovén (1846). This

<sup>1</sup> Named in honour of the late General de Stefanis of Naples, who was an assiduous conchologist, and made an extensive collection of shells from that part of the Mediterranean. He rendered me much kind assistance.

variety, as well as a specimen from Corsica, are more or less smooth, and sometimes destitute of the spiral striæ.

*Fossil.* Pliocene: Red and Coralline Crag, and Monte Mario. Post-tertiary: Norway and Sweden, Scotch and Irish "glacial" beds, Mammalian Crag, Selsea and Leghorn; 0-460 ft.

Among the synonyms are *R. minutissima* of Michaud and *R. multilineata* of Stimpson. Not *R. striata* of Quoy and Gaimard.

It is a favourite food of the Eider Duck and other sea-fowl.

### 32. *RISSOA AFFINIS*<sup>1</sup>, Jeffreys. (Platc IX. fig. 8.)

SHELL oblong, slender, rather thin, semitransparent, and glossy: sculpture slight and indistinct, not sharp and thread-like, spiral striæ, of which there are about 15 on the last whorl, less than half that number on the penultimate whorl, and mere traces on the next; the topmost whorl is smooth: colour whitish: spire rather elongated: whorls 4, moderately convex, the last exceeding two thirds of the whole; apex bulbous and somewhat truncated: suture slight: mouth triangular, sharply pointed above: outer lip thin, somewhat expanded: inner lip reflected on the pillar, and thickened: peristome continuous. L. 0.0125. B. 0.005.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 16. A single specimen from each station.

Differs from *R. striata* in being broader proportionately to the length, having 4 instead of 5 or 6 whorls, fewer and less distinct spiral striæ, and no trace of longitudinal striæ, with an expanded mouth and an acute-angled corner at the top. *R. arenaria* has a shorter spire, stronger and sharper sculpture, swollen whorls, a deep suture, and roundish mouth. The present species is not *R. affinis* of Benoit, which is (ex visu typi) *Hydrobia ventrosa*.

### 33. *RISSOA ARENARIA*, Mighels and Adams.

*Cingula arenaria*, Migh. & Ad. in Boston Journ. Nat. Hist. iv. (1842), p. 49, pl. iv. f. 24.

'Lightning' Exp. St. 2.

*Distribution.* Spitzbergen, Vadsö (*Verkrüzen*); Bohuslän (*Lovén*), Greenland, Canada, Casco B., and Grand Manan; 5-40 fms.

*Fossil.* Post-tertiary: Greenock and Canada.

*R. mighelsi* of Stimpson, who changed the name, because he said this species was not the *Turbo arenarius* of Montagu. But Montagu never described or mentioned any species of that name. *Helix arenaria* of Maton and Rackett (*Turbo arenarius* of Turton) is *Odostomia decussata*. *R. exarata* of Stimpson is a variety of the present species, judging from his description and figure, as well as from a typical specimen given me by the lamented Professor; this variety was also found by Professor G. O. Sars in Finmark.

The animal was described by me in the 'Annals and Magazine of Natural History' for March 1877.

<sup>1</sup> Allied, so. to *R. striata*.

34. *RISSOA TENUISCULPTA* (Jeffreys), Watson.

*R. tenuisculpta*, Wats. in Proc. Zool. Soc. 1873, p. 369, pl. xxxvi. f. 28.

'Porcupine' Exp. 1870: Atl. St. 9, 16, 17a, 26, 36; Med. 53, Adventure Bank. One of the specimens has the middle whorl keeled or angular.

*Distribution.* Bay of Biscay (*de Folin* and 'Travailleur' Exp.), Mediterranean (Italian Exp.), Madeira (*McAndrew* and *Watson*), off Culebra I. and Ascension ('Challenger' Exp.); 25-640 fms.

The sculpture is more or less strong, and the size of the last whorl and of the mouth is variable. In my deep-sea specimens the longitudinal striæ are distinct, numerous, and curved (flexuous on the last whorl), but they do not extend below the periphery. Mr. Watson says, "Longitudinal lines of growth few, faint, hair-like." From a careful comparison of many specimens with those of *Rissoa? coriacea*, Manzoni (Journal de Conchyliologie, 1868, pp. 160 and 242, pl. x. f. 6), I should be inclined to unite the two *Maderian* species. In such case the latter specific name would have precedence.

35. *RISSOA PROXIMA*, Alder.

*R. proxima* (Alder), Forbes & Hauley, iii. p. 127, pl. lxxv. f. 7, 8; B. C. iv. p. 39; v. p. 208, pl. lxxviii. f. 3.

'Porcupine' Exp. 1869: St. 2, 18. 1870: Atl. 10.

*Distribution.* Loffoden Isles to the Mediterranean; 15-108 fms.

*Fossil.* Pliocene: Coralline Crag, Siena and Palermo.

This species was first and fully described by me in the 'Annals and Magazine of Natural History' for 1848 (p. 16), under the name of *R. striatula*, and that specific name has the priority of many years over the late Mr. Alder's name of *proxima*. But in order to prevent my name being confounded with that of *Turbo striatulus*, Linné (which, however, is a species of *Odostomia*), I afterwards relinquished my name and adopted that of Alder, by which the species is now generally known to conchologists. Perhaps I was not in strictness justified in doing so.

36. *RISSOA VITREA*, Montagu.

*Turbo vitreus*, Mont. Test. Brit. p. 321, t. 12. f. 3.

*R. vitrea*, B. C. iv. p. 40; v. p. 208, pl. lviii. f. 4.

'Porcupine' Exp. 1869: St. 2, 18. 1870: Atl. 10; Vigo B., 29, 30; Med. 50, Benzert Road.

*Distribution.* Bohuslän (*Malm*) to the Mediterranean; 12-249 fms.

*Fossil.* Miocene: Transylvania (*Hauer* and *Stache*)? Pliocene: Coralline Crag and Italy. Post-tertiary: Sweden, Belfast, and Leghorn.

Not *R. vitrea* of Nyst or of M. Sars.

See B. C. iv. p. 40, as to the characters which distinguish this species from *R. proxima*.

37. *RISSOA SUBSTRIATA*, Philippi.*R. substriata*, Phil. Moll. Sic. ii. p. 132, t. xxiii. f. 20.

'Porcupine' Exp. 1870: Atl. St. 27, 28, 30, 36, Tangier B.; Med. 50.

*Distribution.* G. Lyons (*Martin*, f. *Monterosato*), and Marseilles (*Marion*).*Fossil.* Pliocene: Tuscany (*de Stefani*), Calabria (*Tibéri*), and Sicily (*Philippi* and *Monterosato*).

Some specimens have the outer lip thickened by a slight rib. Philippi says, "labrum simplex." The spiral striæ are occasionally stronger than the longitudinal striæ; and in such cases there is no regular reticulation, as described by him.

38. *RISSOA SOLUTA*, Philippi.*R. soluta*, Phil. Moll. Sic. ii. p. 130, t. xxiii. f. 18: B. C. iv. p. 45; v. p. 208, pl. lxviii. f. 7.

'Lightning' Exp. St. 4.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 26, Tangier B.; Med. Adventure Bank.

*Distribution.* Finmark to the Archipelago and Adriatic; 20-300 fms.*Fossil.* Pliocene: Central and Southern Italy. Post-tertiary: Norway, Rhodes; 0-100 ft.Cantraine described the mouth of his *R. obtusa* as "obliqua," and the peristome as "continuo"; and neither he nor Philippi noticed the spiral striæ or the umbilical chink. His description, therefore, is not quite applicable to the present species; and I still think the name given by Philippi should be retained, especially as the latter illustrated his description by a figure.39. *RISSOA TURGIDA*, Jeffreys.*R. turgida*, Jeffr. in Ann. & Mag. Nat. Hist. 1870, p. 8: G. O. Sars, Moll. arct. Norv. p. 183, t. 10. f. 12, a-b.

'Porcupine' Exp. 1870: Atl. St. 3, 6, 27, 28, 34.

*Distribution.* North Cape to Christianiafiord, Bay of Biscay ('Travailleur' Exp. 1882), New England (*Verrill*); 100-487 fms.*Fossil.* Pliocene: Sicily (*Monterosato* and *Seguenza*).

The slight ridge or line which encircles the periphery is less distinct in some than in other specimens.

40. *RISSOA SEMISTRIATA*, Montagu.*Turbo semistriatus*, Mont. Test. Br. Suppl. p. 136.*R. semistriata*, B. C. iv. p. 46; v. p. 208, pl. lxviii. f. 8.

'Lightning' Exp. St. 4.

'Porcupine' Exp. 1870: Atl. Vigo B., 36.

*Distribution.* Norway, Faroe Isles, Denmark, Great Britain and Ireland, northern and western coasts of France and Spain, Mediter-

raean, Adriatic, and var. Madeira (*Watson*); 0-80 fms. Bay of Biscay ('Travailleur' Exp. 1881); 640 fms., most probably drifted.

*Fossil.* Pliocene: Monte Mario. Post-tertiary: Portrush and Leghorn.

I would refer to 'British Conchology' for the synonyms of this rather variable species. And I am inclined to add to the list my *R. picta*, as well as *R. granulum* of Philippi, *R. galvagni* of Aradas, *R. depicta* of Manzoni, *R. maculata* and *R. concinna* of Monterosato, *R. tenuiplicata* of Seguenza, and *R. æmula* of Granata.

I regret to differ so much from some continental conchologists with respect to the comparative value of certain characters which have induced them to make so many species out of what I believe to be mere varieties; but I do not attach so great an importance as they evidently do to the difference of specimens, which are abundant, widely distributed, and consequently variable. However, they may have as much right to regard these as distinct species as I have to consider them varieties; and it is not very important whether such forms are called by one name or the other.

Some specimens have a reticulated sculpture in consequence of the spiral striæ covering all the surface of the shell, and being crossed by close-set longitudinal striæ. The texture of these specimens is thicker and stronger than usual.

#### 41. *RISSEA CINGILLUS*, Montagu.

*Turbo cingillus*, Mont. Test. Br. p. 328, t. 12. f. 7.

*R. cingillus*, B. C. iv. p. 48; v. p. 208, pl. lxxviii. f. 9.

'Porcupine' Exp. 1869: St. Donegal B.

*Distribution.* Iceland (as *Helix pella* of Linné)? Norway, Sweden, Denmark, Faroe and British Isles, northern and western coasts of France and Spain, Mediterranean; 0-20 fms.

*Fossil.* Post-tertiary: Scotland, Ireland, and Tuscany.

Several old synonyms; but if the existence of this species in Iceland were established, instead of doubtfully depending on the authority of Zoega, one of Linné's pupils, the specific name ought to be *pella*, although by no means appropriate.

#### 42. *RISSEA ASTURIANA*, Fischer.

*Plagiostila asturiana*, Fisch. in 'Les Fonds de la Mer,' i. p. 50, pl. 11. f. 5.

'Porcupine' Exp. 1870: Med. St. Gibraltar Bay.

*Distribution.* Gijon and Vigo Bay (*de Folin*); 10-18 fms.

I cannot separate this species, however peculiar and interesting, from *Rissoa* by any definite character. In comparison with *R. lactea* the shape is similar; the papillary apex, the disproportionately large size of the last whorl, the obliquity of the axis or pillar, the semilunar form of the aperture or mouth, and the thickened peristome are the same in each of those species. The chief difference consists in the present species being devoid of sculpture. Perhaps both species might constitute another section of *Rissoa*.

1. *HYDROBIA ULVÆ*, Pennant.

*Turbo ulvæ*, Penn. Br. Zool. iv. p. 132, pl. lxxxvi. p. 120.

*Hydrobia ulvæ*, B. C. iv. p. 52; v. p. 208, pl. lxix. f. 1.

'Porcupine' Exp. 1869: St. Donegal B. (type and vars. *barleei* and *octona*), 19 (var. *barlesi*), 58 (same variety). 1870: Med. 50 (var. *subumbilicata*).

*Distribution*. Everywhere between tidemarks and in brackish water throughout the eastern portion of the North Atlantic, from Finmark and Novaia Zembla, southwards to the Mediterranean and Adriatic; California (*P. Carpenter*)? A chance specimen of the variety *barleei* was dredged in the Bay of Biscay during the 'Travailleur' Expedition of 1880 at the depth of 1062 fathoms!

*Fossil*. Pliocene and Post-tertiary: Scandinavia, Great Britain and Ireland (including the Coralline, Red, and Mammalian Crags), Leghorn, Southern Italy, and Rhodes.

This abundant and widely distributed little shell has long served as a manufactory of nearly countless species; and even undistinguishable and useless genera, such as *Peringia* and *Peringiella*, have been invented to show the ingenuity of ambitious conchologists. *Assimineæ gallica* of the late Dr. Paladilhé is another synonym, as I have ascertained from the inspection of typical specimens which that author kindly sent me. *Turbo minutus* of Totten, which inhabits similar situations on the western coasts of North America, and which I found plentifully on the seaboard of Canada and New England, appears to be a different species. See also 'British Conchology' for synonyms and varieties.

2. *HYDROBIA COMPACTA*, Jeffreys. (Plate IX. fig. 9.)

SHELL conical, thick, semitransparent, and glossy: *sculpture* none, except in the periphery being obtusely angular: *colour* yellowish: *spire* rather short, bluntly pointed: *whorls* 6, flattened, gradually increasing in size; the last occupies about two thirds of the spire when viewed in a supine position: *suture* slight but distinct: *mouth* oval, contracted above and angular below: *outer lip* somewhat thickened: *inner lip* also thickened, and reflected on the pillar: *peristome* continuous: *base* imperforate. L. 0·175. B. 0·1.

'Porcupine' Exp. 1870: Atl. St. Tangier B. Several dead specimens.

Differs from *H. ulvæ* in its shape, which is that of a short cone, in the periphery being angular or keeled at all stages of growth, and in the base being imperforate. I cannot identify the present species with any of those which were described and figured by Paladilhé in his 'Nouvelles Miscellanées Malacologiques.' Much confusion seems to have been caused by him and other continental writers, not only in making so many worthless genera of this family (*Littorinidæ*), but in referring species of *Hydrobia* to *Assimineæ*, which belongs to the Pulmonobranchiata. For instance, in describing his *Assimineæ obeliscus* (which is apparently one of the numerous

<sup>1</sup> Compact.

varieties of *H. ventrosa*) he criticizes Küster for placing among the *Hydrobiae* Pennant's *Turbo ulvæ*, contending that it is "une véritable *Assiminea*." I have already shown in 'British Conchology,' vol. v. p. 208, and in the foregoing notice of *H. ulvæ*, that *A. gallica* of Paladilhé is the typical form of the above species.

#### Family X. PALUDINIDÆ.

*BITHYNIA RUBENS*, Menke.

*Paludina rubens*, Menke in Chemn.-Küst. pl. 9. f. 27-29.

'Porcupine' Exp. 1870: Med. St. 51. Two small specimens, which had been probably carried out to sea from a freshwater river or stream and deposited in 1415 fathoms.

*Distribution*. Sicily, Algiers (coll. Weinkauff.).

#### Family XI. HETEROPHROSYNIDÆ.

*BARLEEIA RUBRA*, Montagu.

*Turbo ruber*, Mont. Test. Br. p. 320.

*B. rubra*, B. C. iv. p. 56, pl. I. f. 2; v. p. 209, pl. lxix. f. 4.

'Porcupine' Exp. 1870: Atl. St. Gibraltar B.; Med. 50, Benzert Road.

*Distribution*. Hellen in Bergensfiord (*Friele*), northern and western coasts of Ireland, southern counties of England, N. and W. coasts of France and Spain, Mediterranean and Adriatic, Canaries and Madeira (*McAndrew*), C. Verd I. (*Rochebrune*), off Pernambuco ('Challenger' Exp.)!; littoral and laminarian zones to 120 fms., the greater depths being probably accidental. I distrust the recorded localities in Scotland, the North of England, and South Wales.

*Fossil*. Pliocene: Central and Southern Italy. Post-tertiary: Leghorn.

The only noticeable synonym is *Rissoa fulva* of Michaud.

#### Family XII. SKENEIDÆ.

*HOMALOGYRA DENSICOSTATA*<sup>1</sup>, Jeffreys. (Plate X. fig. 1.)

SHELL somewhat resembling in shape *Planorbis trivolvis* of Say, rather thin, semitransparent, and glossy: *sculpture*, extremely numerous and close-set striae in the earlier and middle stages of growth, which ultimately disappear and become microscopic lines; the upper part of the periphery as well as the base of the shell are encircled by a sharp keel which intersects the spiral striae: *colour* whitish: *spire* deeply sunk on both sides: *whorls* 4, compactly coiled; the last is swollen and disproportionately large; the others rapidly decrease in size: *suture* narrow but excavated: *mouth* horseshoe-shaped, with a thin edge, and expanding outwards: *umbilicus* very wide and open, completely exposing the spire on each side. L. 0.05. B. 0.075.

<sup>1</sup> Closely ribbed.

'Porcupine' Exp. 1870: Atl. St. 16, 17a. Two specimens, one of which appears to be full-grown and the other half-sized: both are now figured.

*Distribution.* 'Bulldog' Exp., Long. 54° 33' W., Lat. 55° 36' N. (Wallich); 1622 fms. 1 A smaller specimen. I had at first mistaken it for *H. rota*. See 'British Conchology,' vol. iv. p. 72.

#### Family XIII. VERMETIDÆ.

SILICUARIA ANGUINA, Linné.

*Serpula anguina*, L. S. N. p. 1267.

*Silicuarina anguina*, Philippi, Moll. Sic. i. p. 173, t. ix. f. 24, a-e.

'Porcupine' Exp. 1870: Med. St. off Jijeli, Rasel Amoush.

*Distribution.* Throughout the Mediterranean and Adriatic, Cape Verd I. ('Talisman' Exp. 1882); 30-122 fms.

*Fossil.* Miocene: Vienna Basin, Switzerland, Maine-et-Loire, Touraine, and Madeira. Pliocene: South of France, and Italy. Post-tertiary: Pozzuoli, Sicily, Morea, and Rhodes.

It would be interesting to know the nucleus of this curious shell. I have never seen a quite perfect specimen, although the species is not uncommon. In the young the spire is irregularly twisted upwards and is occasionally heterostrophe, with a circular mouth; at this stage of growth there is no indication of the peculiar slit.

#### Family XIV. TURRITELLIDÆ.

Genus *STILBE*<sup>1</sup>, Jeffreys.

SHELL forming an elongated cone, smooth, and of a glittering lustre; nucleus or apex of the spire regularly and bluntly pointed: mouth somewhat angular at the base.

Neither the soft parts of the animal nor the operculum being yet known, I cannot satisfactorily assign this remarkable shell to any family; but all the characters above given agree with those of *Turritellidæ*.

*STILBE ACUTA*<sup>2</sup>, Jeffreys. (Plate X. fig. 2.)

SHELL stiletto-shaped, thin, semitransparent, and very glossy: sculpture none, except slight and microscopic lines of growth: colour milk-white: spire tapering: whorls 10, convex, very gradually increasing in size; apex somewhat compressed: suture distinct and deepish: mouth oval, pointed above and below, a little dilated at the base: outer lip sharp: inner lip interrupted above, reflected on the pillar, behind which is a narrow slit or umbilical chink. L. 0.25. B. 0.1.

'Porcupine' Exp. 1870: Atl. St. 16. One perfect specimen and the lower half of another.

*Distribution.* 'Bulldog' Exp., Long. 54° 33' W., Lat. 55° 36' N. (Wallich); 1622 fms. A smaller specimen.

<sup>1</sup> Στίλβη, splendour.

<sup>2</sup> Pointed.

1. *TURRITELLA TEREBRA*, Linné.*Turbo terebra*, L. S. N. p. 1239.*Turritella terebra*, B. C. iv. p. 80, pl. ii. f. 1; v. p. 209, pl. lxx. f. 6.

'Porcupine' Exp. 1869: St. 1, 6, 9, 13, 14, 15, 18, 23a, 25, 63. The Minch, Little Minch, Loch Torridon, off Lerwick. 1870: Atl. 12, Vigo B., 13, 16, Setubal B., 22, 25, 26, off C. Sagres, 30-34, Tangier B.; Med. 45, Capo de Gata, Cartagena B. (and var. *gracilis*), 50, 55, Benzert Road, Rasel Amoush, G. Tunis, Adventure Bank, off Rinaldo's Chair, 58.

*Distribution.* Abundant throughout the coasts of the European seas from Loffoden and the Faroe Isles southwards to the Mediterranean and Adriatic, as well as of Morocco, Algeria, and Tunis; 3-100 fms.

*Fossil.* Pliocene: Biot, and Italy. Post-tertiary: Sweden, Great Britain and Ireland, S.W. France, Leghorn, Morea, Rhodes, and Cos; 0-1350 ft. Not *T. terebra* of Philippi from the Cassel tertiary, which is *T. geinitzi* of Speyer. The fry of the present species was referred by Costa to the extinct genus *Murchisonia*.

Synonyms. *Turbo tricarinatus* of Brocchi (not *Turritella tricarinata* of King), *Turritella communis* and other so-called species of Risso, and perhaps also *Turbo unguinus* of Linné.

Extremely variable as to the number and proportionate size of the spiral ridges or striæ. The apex is bulbous and somewhat intorted.

2. *TURRITELLA INCRASSATA*, James Sowerby.

*T. incrassata*, Sow. Min. Conch. Gt. Brit. (1812), vol. i. p. 111, t. 51. f. 6.

*T. triplicata*, Reeve, Icon. Conch. (*Turritella*), pl. ix. f. 43, a, b.

'Porcupine' Exp. 1870: Atl. St. 3a, Vigo B., 16, Tangier B., Gibraltar B.; Med. 50a, Benzert Road, Rasel Amoush, Adventure Bank (and var. *bicincta*), 58.

*Distribution.* Western coasts of France and Spain, Mediterranean, Adriatic, and Canaries; 6-150 fms. Heligoland (*Leuckart*)?

*Fossil.* Miocene: Maine-et-Loire (*Bardin*). Pliocene: English and Belgian Crags (and var. *bicincta*), S.W. and S. France, Italy. Post-tertiary: "Glacial beds of Wexford, not rare" (*Forbes*)?, Cornwall (S. V. Wood; specimens nearly as large as those of the recent variety *turbona* of Monterosato), Leghorn, Rhodes, and Cyprus.

There are a few synonyms, besides *Turbo triplicatus* and other species of Brocchi.

One recent specimen, which had been repaired in the middle of the spire, had only a single ridge or keel on the last two whorls.

*MESALIA SUTURALIS*, Forbes.

*Turritella suturalis*, Forb. Rep. Æg. Inv. (1843), p. 189.

*Mesalia brevisalis*, Reeve, Icon. Conch. (*Mesalia*), pl. i. f. 2a, not f. 2b.

'Porcupine' Exp. 1870: Atl. St. C. Sagres, Tangier B.; Med. Algeciras B.

*Distribution.* Portugal (McAndrew, as *M. sulcata*), Gibraltar (McAndrew and Ponsonby)!, Algeciras (Paz, f. Hidalgo, as *M. brevis*), Aci-Trezza, Sicily (Aradas, as last), Aegean (Forbes, as *Turritella suturalis*), Algiers (coll. Weinkauff)!, Mogador (McAndrew, as *M. sulcata*, var.)!

The name *suturalis* is not classical, but it may have been used to signify the suture, which is conspicuous in this species. Reeves's figure is not satisfactory, because it does not show the peculiar shape of the mouth. The characters by which *Mesalia* (Gray, 1842) may be distinguished from *Turritella* seem to consist in the operculum of the former being paucispiral instead of multispiral, the apex of the spire being blunt and regular or mammiform, the outer lip flexuous, and the mouth at its base expanded or effuse. *Turritella brevis* of Lamarck is a larger shell, and is described as smooth with a single furrow near the suture. The type of Gray's genus is *Turritella sulcata* of Lamarck, a Grignon or Eocene fossil, which therefore cannot be the present species, although it was mistaken for it by McAndrew.

#### Family XV. SCALARIIDÆ.

##### 1. SCALARIA SUBDECUSSATA, Cantraine.

*S. subdecussata*, Cantr. Diagn. Moll. in Bull. Acad. Brux. ii. p. 338; Mal. Med. pl. vi. f. 24.

'Porcupine' Exp. 1870: Atl. St. off C. Sagres, 28-28 a, 30; Med. 55, Benzert Road.

*Distribution.* Atlantic coasts of France and Spain, Mediterranean, Madeira, and Canaries, 20-57 fms.

*Fossil.* Pliocene: Altavilla (Tiberi).

*Mesalia striata* of A. Adams according to McAndrew, but this species is described as from the Philippine Islands. It is, however, *M. plicata* of Adams from the Canary Isles, and *Turritella philippi* of Aradas and Benoit.

Some specimens are throughout ribbed lengthwise, while others have slight and indistinct ribs on the upper whorls only. The shell is equally variable with respect to the number, and in part occasional absence of the spiral striæ. The sculpture in one of the 'Porcupine' specimens closely resembles that of *Turbo corrugatus*, Brocchi, and the base is likewise keeled; but the whorls in the present species are compressed or flattened, and in *Scalaria corrugata* they are convex and the suture is deep.

Monterosato has given some interesting particulars of the animal in the 'Journal de Conchyliologie' for 1878, p. 152, showing differences from *Turritella* and *Scalaria*.

##### 2. SCALARIA LONGISSIMA, Seguenza. (Plate X. fig. 3.)

*S. longissima*, Seg. Form. Terz. Reggio, 1879, p. 266.

'Porcupine' Exp. 1869: St. 45. 1870: Atl. 16.

*Distribution.* Azores ('Talisman' Exp. 1883); 681 fms.

*Fossil.* Pliocene: Messina, and Reggio in Calabria (Seguenza).

The 'Porcupine' specimens are imperfect, but those from the

'Talisman' Expedition resemble *S. torulosa* of Brocchi; and the present species may be a slightly altered descendant of the latter species. *S. lanceolata*, which is also a Subapennine fossil, seems to deserve more especially the name or epithet *longissima*.

### 3. SCALARIA GENICULATA, Brocchi.

*Turbo geniculatus*, Broc. Conch. Foss. Subap. ii. p. 659, t. xvi. f. 1.

'Porcupine' Exp. 1870: Atl. St. 3a, 6; Med. 50, 50a.

*Distribution*. Cap Breton (*de Folin*), Bay of Biscay ('Travailleur' Exp. 1882), Palermo (*Monterosato*); 97½-340 fms.

*Fossil*. Pliocene: Central and Southern Italy.

I am indebted to the kind generosity of my friend the Marquis de Folin for an exquisite and quite perfect specimen of this lovely shell. It is nearly an inch long and contains the operculum. It has 17 whorls, the 4 topmost of which are smooth and polished and form a short pointed cone. The colour is reddish-brown, with a white and thick outer lip; there is no peristome, in consequence of the inner lip being incomplete and scarcely discernible. Some of the ribs in recent or living as well as in fossil specimens are occasionally varicose or unusually thickened.

The Marquis de Folin most obligingly proposed to give my name to the species, not being aware that it had been already described.

### 4. SCALARIA VITTATA<sup>1</sup>, Jeffreys. (Plate X. fig. 4.)

SHELL slender, rather thin, semitransparent, not glossy: sculpture, about 15 sharp and curved, but not much raised longitudinal ribs, each being crowned or surmounted just below the suture with a short spine; the interstices of the ribs are closely striated spirally, and decussated by more than twice as many microscopic longitudinal striae; the first 3 or 4 whorls are smooth and polished: colour pale yellowish-brown, with three spiral bands of a much deeper hue on the last whorl and two on each of the succeeding whorls except those at the top; the bands on the last whorl are equidistant, one below the suture, the middle one round the periphery, and the third (which is the broadest) encircling the base: spire gradually tapering; apex finely pointed: whorls 12-14, moderately convex: suture deep: mouth roundish-oval, angular at the inner base: outer lip strengthened by the last rib, and slightly expanded: inner lip reflected on the pillar, and continuous with the outer lip. L. 0.5. B. 0.15.

'Porcupine' Exp. 1870: Med. St. 50, Benzert Road.

*Distribution*. Off west coast of Africa ('Talisman' Exp.); 1254 fms.

### 5. SCALARIA CANTRAINEI, Weinkauff.

*S. cantrainei*, Weink. in Journ. de Conchyl. 1866, xiv. pp. 241, 246. Contr. Mal. Med. pl. vi. f. 16 (sine nomine).

'Porcupine' Exp. 1870: Med. 50, 50a, Rasel Amoush, Adventure Bank.

<sup>1</sup> Banded.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1880 and 1881), southern districts of the Mediterranean and coasts of northern Africa, and the Adriatic; 70-552 fms.

*S. kuzmici* of Brusina. Tiberi considered the present species *S. muricata* of Risso; but I cannot agree with him in this determination. Risso's figure 45 looks more like *S. frondosa*, and his description of *S. muricata* may be applicable to almost any species.

This is a more slender shell and has fewer ribs than *S. trevelyana* of the same size. The young of *S. turtonæ* is also more conical, and the ribs are compressed and continuous, instead of being sharp and muricated or prickly at the top of each whorl. Some of the ribs are occasionally varicose or dilated as in other species of *Scalaria*.

6. *SCALARIA ALGERIANA*, Weinkauff. (Plate X. fig. 5.)

*S. coronata*, Weink. in Journ. de Conchyl. x. p. 348.

*S. algeriana*, id. in *op. cit.* xiv. pp. 241, 247.

'Porcupine' Exp. 1870: Atl. St. 17a, 26-34, 36; Med. 50, Adventure Bank.

*Distribution.* C. Breton (*de Folin*); and the Mediterranean coasts of Spain, Italy, and Algeria; 15-130 fms.

*Fossil.* Pliocene: Siena, Reggio, and Messina.

I do not agree with Hidalgo that this is the *S. uncinaticosta* of d'Orbigny (Moll. Cuba, pl. xi. f. 25-27), which is described as "rosea, anfractibus 9, costis 11 crassis, inæqualibus." After a careful examination and comparison of Weinkauff's descriptions of his *S. algeriana* and *S. schultzei* with each other as well as with his typical specimens of those species, I have failed to make out any difference between them. Both have the interstices of the ribs spirally or transversely striated in the same manner. The present species also agrees with *S. pulchella* of Bivona in that respect; but the spiral striæ are finer and less distinct in *S. pulchella* than in *S. algeriana*, the longitudinal ribs are more than twice as many in the former as in the latter species, and the shape is rather conical instead of cylindrical. Another synonym of *S. algeriana* is *S. multilineata* of Philippi (Zeitschr. f. Mal.); but that name was pre-occupied by Say for a well-known North-American species. *Rissoa*? *coronata* of Scacchi, described and figured by Philippi in his work on the Mollusca of the two Sicilies, being the same species as *S. hellenica* of Forbes, perhaps *coronata* ought to replace *algeriana*; but it is immaterial.

7. *SCALARIA NANA*<sup>1</sup>, Jeffreys. (Plate X. fig. 6.)

*SHELL* conical, of a delicate texture, semitransparent, not glossy: *sculpture*, numerous and close-set curved lamellar ribs or ridges, of which there are about 30 on the body-whorl; the interstices are crossed by a few spiral striæ: the first 3 or 4 whorls are smooth

Dwarf.

and glossy: *colour* pale yellowish-white: *spire* short, abruptly tapering; apex pointed: *whorls* 7-8, convex; the last equals two thirds of the shell when placed in a supine position, and more than one third of the spire when the shell is placed with the mouth downwards: *suture* deep: *mouth* nearly round, slightly angular at the upper corner: *outer and inner lips* somewhat expanded; peristome continuous; there is a small umbilical chink between the inner lip and the pillar. L. 0.15. B. 0.075.

'Porcupine' Exp. 1870: Atl. St. 9, 16, 17, 17a, Setubal B., 26; Med. Adventure Bank.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1881); 1093 fms.

*Fossil.* Pliocene: Messina (*Sequenza*)!

I have compared this little species with the young of all the known species from the North Atlantic and the Mediterranean, and I am satisfied that it is distinct.

#### 8. SCALARIA SEMIDISJUNCTA<sup>2</sup>, Jeffreys. (Plate X. fig. 7.)

SHELL corkscrew-shaped or forming a twisted cylinder, thin, semitransparent, and rather glossy: *sculpture*, numerous and close-set flexuous and sharp lamellar ribs, of which there are about 20 on the body-whorl; the first 3 or 4 whorls are smooth and regular; the ribs as well as their interstices are crossed by equally numerous, but very fine spiral striæ: *colour* pale yellowish-white: *spire* elongated or drawn out, and gradually tapering; apex conical and mammillar; *whorls* 7-8, convex, angular, and spinous (*muricei*) at the top of each; the last nearly equals one half of the shell when placed on its back, and between one third and one fourth of the spire in a reversed position: *suture* deeply excavated: *mouth* circular, with a slight angularity at the upper corner: *outer and inner lips* thin-edged, the latter being expanded, and folded back on the pillar; peristome continuous or complete; no umbilical chink. L. 0.5. B. 0.5.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17a. Three specimens of different sizes, and fragments of four other specimens.

*Distribution.* Azores ('Talisman' Exp. 1883); 2199 fms.

This very remarkable species has many of the characters belonging to the last species; but I do not think it can be a monstrous form of *S. nana*, because (in addition to other characters which may be observed by comparing the descriptions of both species) so many similar specimens and fragments of the present species occurred with the other species in the extraordinary haul off the coast of Portugal, which I noticed in my report of the second 'Porcupine' Expedition of 1870. See the 'Proceedings of the Royal Society' for that year, pages 155 and 156.

*S. disjuncta* of Brown from Castellarquato is described as having the last whorl furnished with a convex keel on the base.

<sup>2</sup> Half-disjoined.

9. *SCALARIA CLATHRATULA*, Adams.

*Turbo clathratulus*, Adams on the Microscope, t. 14. f. 19.

*S. clathratula*, B. C. iv. p. 96; v. p. 210, pl. lxxi. f. 5.

'Porcupine' Exp. 1870: Atl. St. 2, 3, 3a, 9, Vigo B., 16 (and var. *producta*), 17a, 26-29 (and var. *spinosa*), 30, Tangier B., Gibraltar B.; Med. Benzeret Road.

*Distribution*. Bohuslän, Shetland to the Channel Isles, France, Spain, Portugal, Italy, Algeria, Morocco, Madeira, and New England; 0-681 fms. Apparently not Belgium, as stated by M. de Malzine under the name of *S. pulchella* of Philippi and Kiener.

*Fossil*. Pliocene: English and Belgian Crags, Biot, Nice, Monte Mario, and Messina. Not Miocene, as *S. clathratula* of Hörnes, which is evidently a different species.

This was confounded by me as well as by many other writers with *S. pulchella* of Bivona. That species attains to a larger size and is proportionately broader; the ribs are much more numerous and crowded, and their interstices are closely and regularly striated in a spiral direction. Neither Bivona nor Philippi noticed the spiral striae. The present species is *S. soluta* of Tiberi (Journ. de Conch. 1863), and *S. dalliana* of Verrill and Smith.

The variety *spinosa* from Stations 26 to 29 of the 1870 Expedition has a spine at the top of each rib below the suture. It is analogous to the variety *loveni* of *S. grænlandica*. Other species and varieties are also crested in the same manner. In some specimens of the present species the ribs are more numerous than in others. The variety *producta* from Station 16 of the same Expedition has a longer spire and twice the usual number of ribs.

10. *SCALARIA FRONDOSA*, J. & J. D. C. Sowerby.

*S. frondosa*, Min. Conch. vol. vi. (1829), p. 149, t. 577. f. 1.

*S. soluta*, Tiberi in J. de Conch. (1868), pl. vi. f. 3.

'Porcupine' Exp. 1870: Atl. St. 17, 24, 26-29, 36; Med. Rasel Amoush, Adventure Bank, 58.

*Distribution*. Bay of Biscay (*de Folin*), throughout the Mediterranean (*Tiberi* and others), off Madeira ('Travailleur' Exp. 1882); 20-547 fms.

*Fossil*. Pliocene: Red and Coralline Crag, and from Piacenza to Ficarazzi in Italy. Probably not the Antwerp Crag as *S. frondosa* of Nyst.

To show the number of synonyms which encumber certain species like the present, being peculiar and not generally known, I may instance the following as appertaining to *S. frondosa*:—*S. Celesti*, Aradas, *S. pumila*, Libassi, *S. rugosa*, Costa, *S. crispa*, Scacchi (not Lamarck), *S. eximia*, v. Pecchioli, *S. Pecchioliana*, Issel, and *S. Gravitellensis*, Seguenza, besides *S. soluta*, Tiberi (1868, not 1863). *S. foliacea* of Searles Wood appears to be a variety of the present species. I have already alluded to the possibility of Risso's bad figure of his *S. muricata* being intended to represent *S. frondosa*; Risso's publication was three years older than Sowerby's,

The interstices of the ribs in this species are regularly and distinctly striated in the direction of the spire. My largest specimen from the 'Porcupine' Expedition is three quarters of an inch in length by nearly half an inch in breadth.

I have also from Rasel Amoush fragments of a species which appears to be *S. frondicula* of Searles Wood. That species is more slender and has more ribs than *S. frondosa*. As a Pliocene fossil it occurs in the Coralline Crag of Suffolk, the Antwerp Crag, and at Reggio in Calabria. Monterosato gives Palermo and S. Vito for *S. frondicula* as a recent or living species.

#### 11. SCALARIA TREVELYANA, Leach.

*S. trevelyana* (Leach, MS.), Winch on the Geology of Lindisfarn, in Ann. Phil. new series, iv. p. 434: B. C. iv. p. 93; v. p. 209, pl. lxxi. f. 4.

'Porcupine' Exp. 1869: St. 1, 2, 3, 6, 9, 14, 15, 18, 25, 35, 45, 68, off Lerwick. 1870: Atl. 2, 17a, 27-28 $\frac{1}{2}$ .

*Distribution.* Bergen to the Bay of Biscay; 15-645 fms.

*Fossil.* Miocene?: Malaga. Pliocene: Red and Norwich Crag, Biot, and Italy.

*S. pseudopulchella* of Seguenza.

#### 12. SCALARIA COMMUNIS, Lamarck.

*S. communis*, Lam. An. s. Vert. vi. (2), p. 228: B. C. iv. p. 91, pl. ii. f. 3; v. pl. lxxi. f. 3.

'Porcupine' Exp. 1869: St. Donegal B. 1870: Atl. C. Sagres: Med. Algeciras B., Adventure Bank.

*Distribution.* Finmark (*Liljeborg*) and western coast of Norway to the Aegean Sea, Adriatic, Canaries; living between tide-marks to 49 fms.

*Fossil.* Miocene: Bordeaux Basin. Pliocene: Red Crag, Nice, and Italy. Post-tertiary: Norway, Cumbrae, Ireland, West Cheshire, Selsea, S. France, Leghorn, Vesuvius, and Morea: 0-50 ft.

*Turbo clathrus* of the 'Fauna Suecica,' and of the 10th and preceding editions of the 'Systema Naturæ.' Petit therefore named the present species *S. clathrus*, which is more correct than *S. communis* according to the recognized laws of nomenclature.

#### 13. SCALARIA GRÆNLANDICA, Chemnitz.

*Turbo clathrus grænladicus*, Chemn. Conch. Cab. xi. p. 155, t. 195 A. f. 1878, 1879.

*S. grænlantica*, B. C. iv. p. 97.

'Lightning' Exp. St. 2.

'Porcupine' Exp. 1869: St. 65. A living specimen from the last Station (345 fathoms) was nearly two inches long. The animal having been put into boiling water was removed from the shell and kept in spirit of wine; it then gave out a deep violet dye, which did not fade for many years.

*Distribution.* Arctic and northern seas in both hemispheres, southwards to Christianiafjord in Europe and to New England in America, Barentz Sea, and Behring Strait; 8-160 fms. Mr. McAndrew dredged a fresh-looking fragment in 38 fathoms off Duncansby Head in Caithness.

*Fossil.* Pliocene: Newer Crags in our eastern counties. Post-tertiary: Sweden, Aberdeenshire, Bridlington, and Canada.

The uppermost part of the spire is formed of two or three nearly cylindrical and quite smooth whorls; the point or apex is rather blunt and twisted. In a North-American specimen, from which part of the apex had been broken off during the lifetime of the animal, the fracture had been mended and the exposed opening filled by a small convex shelly plug.

It is the *S. subulata* of Couthouy, not of Sowerby's 'Mineral Conchology.'

#### 14. SCALARIA TURTONÆ (*turtonis*), Turton.

*Turbo turtonis*, Turt. Conch. Dict. p. 208. f. 97.

*S. turtonæ*, B. C. iv. p. 89; v. pl. lxxi. f. 2.

'Porcupine' Exp. 1870; Atl. St. C. Sagres; Med. 50 (fragment).

*Distribution.* Loffoden I. to the Ægean, Adriatic, Madeira, and Cape Verd I.; 5-45 fms.

*Fossil.* Pliocene: Red and Norwich Crag, Nice, Central and Southern Italy. Post-tertiary: West of Scotland, Ireland, S. France, Leghorn, and Rhodes.

This species might be the *Turbo ambiguus* of Linné, but for the character "*basi umbilicata*." The best known of several synonyms is *S. tenuicostata* of Michaud.

In that admirable periodical the 'Journal de Conchyliologie' for January 1868 (which contains a review of the 4th volume of 'British Conchology') the Editor, M. Crosse, objected to the specific name *turtonæ*, because it was that of the describer, Dr. Turton; and he remarked that I had not done well to change the original name *turtonis* for *turtonæ*, "sous prétexte que Turton a eu l'intention de donner à l'espèce, non pas son propre nom, mais celui de sa fille." But Dr. Turton, in his 'Conchological Dictionary' (p. 208) expressly gives the credit of discovering this species to his daughter, adding "whose name we have attached to it." That specific name has been adopted and used by all British conchologists, and it is at all events more justifiable than the names proposed by Mr. Clark and Dr. Gray in honour of their wives, and by the old Italian geologist Gioeni in honour of himself. The termination of the specific name in the present case is in strict accordance with the usual custom. By the rules of biological nomenclature, which were framed and adopted by the British Association for the Advancement of Science, specific names may be changed when their meaning is "glaringly false" or they have not been clearly defined. But neither of these objections is applicable to the present case.

15. *SCALARIA ACUS*, Watson. (Plate X. fig. 8.)

*S. acus*, Wats. in Journ. Linn. Soc. (Zoology), 1883, vol. xvi. p. 608.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 31-34.

*Distribution*. Sicily (*Monterosato*), west of Azores and Culebra I. ('Challenger' Exp.) ('Talisman' Exp. 1883); 49-1254 fms.

*Fossil*. Pliocene: Ficarazzi (*Monterosato*).

Every specimen of this pretty little shell which I have seen is spirally or transversely striated, a character unnoticed in Mr. Watson's description. In one of the 'Challenger' specimens from the Azores, fine spiral striæ are perceptible only in the interstices of the ribs; but in the fragment from Culebra Island, as well as in the perfect specimen now figured and the fragments from the 'Porcupine' Expedition, these striæ are stronger and cross the ribs. All the specimens have a basal ridge and a similar apex.

16. *SCALARIA TENERA*<sup>1</sup>, Jeffreys. (Plate X. fig. 9.)

SHELL inclined to cylindrical, thin, semitransparent, and glossy: *sculpture*, numerous slight, curved or somewhat flexuous, and rounded but not prominent ribs, of which there are from 25-30 on the penultimate whorl, those on the last whorl being indistinct or wanting; the ribs are more sharp on the upper whorls; all are crossed by a few delicate and also rounded spiral striæ, which are more conspicuous at the base of each whorl: *colour* whitish: *spire* slender and gradually tapering: *whorls* 10-12, convex: *suture* deep: *mouth* more round than oval, obtuse-angled at the upper corner: *outer lip* thin, expanded at the base: *inner lip* reflected on the pillar and forming with the outer lip a continuous peristome; behind it is a small umbilical chink. L. 0.5 (circa). B. 0.15.

'Porcupine' Exp. 1870: Atl. St. 16. Four fragmentary or imperfect specimens only, but sufficiently characteristic for description and figuring.

17. *SCALARIA COARTATA*<sup>2</sup>, Jeffreys.

*S. obtusicastrata*, G. O. Sars, Moll. arct. Norv. p. 194, t. 22. f. 9, a, b.

*S. varicosa*, id. l. c. p. 348, t. 34, f. 9, a-c.

'Porcupine' Exp. 1870: Atl. St. 16. An imperfect specimen.

*Distribution*. Vadsö and Moldö (G. O. Sars); 100-150 fms.

Having lately, through the accustomed courtesy of the eminent Norwegian Professor, had an opportunity of re-examining his two specimens which he had described and figured as *S. obtusicastrata* and *S. varicosa* on my authority, and having carefully compared them with each other as well as with Searles Wood's and Brocchi's types of the above-named species, I am now convinced that I was mistaken in suggesting the identification of the Norwegian with those fossil species and that both his specimens belong to one and the same species. He quite agrees with me in the latter determination, as well as in adopting the name which I have ventured to

<sup>1</sup> Delicate.

<sup>2</sup> Contracted or narrowed.

propose. I much regret that I was the cause of his having been misled in the first instance.

18. *SCALARIA FORMOSISSIMA*<sup>1</sup>, Jeffreys. (Plate X. fig. 10.)

SHELL slender, exceedingly thin and of a delicate texture, nearly transparent, and rather glossy: *sculpture*, numerous crowded and slight, obliquely flexuous ribs (40-50 on the body-whorl), which are regularly and closely decussated by thread-like spiral striae, causing the whole surface of the shell to appear shagreened or roughened by a file; the four uppermost or apical whorls are obliquely and closely striated lengthwise but not spirally; the base and infrasutural portion of each whorl is more or less distinctly keeled: *colour* milk-white; apical whorls reddish-brown: *spire* elegantly and gradually tapering; apex sharply pointed: *whorls* 12, convex, but angular on the upper part of each: *suture* very deep: *mouth* roundish, angulated below: *outer lip* very thin: *inner lip* expanded and somewhat inflected: *umbilicus* small and narrow, but conspicuous. L. 0.6. B. 0.2.

'Porcupine' Exp. 1870: Atl. St. 16, 17a. One lovely specimen, now figured, and a few others more or less perfect, but much smaller.

*Distribution*. Josephine Bank ('Josephine' Exp.), Azores ('Talisman' Exp. 1883); 340-1514½ fms.

The shell is so very delicate and almost transparent that the purple dye which was emitted by the animal is clearly visible through one of my specimens.

The imperfect and unsatisfactory notice given by the Marquis de Monterosato of his *S. striatissima* may apply to the present species or to *S. algeriana*. If the first-named species were the same as this, I should have been glad to adopt the name which he proposed in spite of *striatissima* not being a classical word; but the author, although an old friend, has not shown the usual courtesy of complying with my repeated request to be allowed to see a specimen of several Mediterranean species which he has merely named, without properly describing any of them. Such names must therefore be treated as manuscript.

19. *SCALARIA PUMICEA*, Brocchi.

*Turbo pumiceus*, Brocchi. Conch. foss. Subap. ii. p. 380, t. vii. f. 3.

*S. serrata*, Calcare, Conch. foss. d'Altavilla, p. 47, t. ii. f. 4.

'Porcupine' Exp. 1870: Atl. St. Gibraltar B.

*Distribution*. Sicily, Algeria, Madeira, and Canaries.

*Fossil*. Miocene: Vienna and Bordeaux Basins. Pliocene: Coralline Crag and Italy.

*S. varicosa* of Lamarck and other synonyms of palaeontologists.

20. *SCALARIA HELLENICA*, Forbes.

*S. hellenica*, Forb. Rep. Æg. Inv. (1844), p. 189.

*Rissoa? coronata* (Scacchi), Philippi, Moll. Sic. ii. (1844), p. 127, t. xxiii. f. 7.

'Porcupine' Exp. 1870: Atl. St. 30; Med. 45, Rasel Amoush, off Rinaldo's Chair.

<sup>1</sup> Most beautiful.

*Distribution.* From Nice to the Archipelago and the coast of Dalmatia, Madeira, and Canaries off Sahara ('Talisman' Exp.); 40-1261 fms.

*Fossil.* Miocene: Vienna Basin.

*S. scacchii* of Hörnes and *S. crassilabrum* of G. B. Sowerby. Not *S. coronata* of Lamarck. Although the Report of Prof. Forbes and the second volume of Dr. Philippi's work bear the same date, the former was published in 1843 at the Annual Meeting of the British Association for the Advancement of Science, and appeared in the 'Athenæum' and other periodicals of that year. I therefore consider that the specific name given by Forbes is entitled to priority.

The first whorls in this species, as is mostly the case in the genus *Scalaria*, are smooth and polished, forming a sharp spike of a reddish-brown colour.

## 21. SCALARIA CRENATA, Linné.

*Turbo crenatus*, L. S. N. p. 1238; Chemn. Conch. Cab. xi. p. 156, t. 195 A. f. 1880, 1881.

*S. crenata*, G. B. Sowerby, Thesaurus Conchyliorum, i. pl. xxxv. f. 123.

'Porcupine' Exp. 1870: Atl. St. Gibraltar B.

*Distribution.* Herm in the Channel Isles, a small and worn specimen (*F. C. Lukis*)<sup>1</sup>, Atlantic coasts of France and Spain (*de Polin*), Mediterranean, Mogador, and Canaries (*McAndrew*); 3-50 fms.

The body of this mollusk is of a yellowish hue mottled with white; the snout or rostrum is thick and strong; the tentacles are spike-shaped, rather long and slender, of a yellowish colour; the eyes are small and black, seated on a slight prominence near the outer base of each tentacle; the foot is thick and short. Animal shy or easily alarmed.

## ACIRSA PRÆLONGA, Jeffreys. (Plate X. fig. 11.)

*A. prælonga*, Jeffr. in Ann. & Mag. N. H. 1877, p. 241.

'Porcupine' Exp. 1870: Atl. St. 16. A single specimen.

*Distribution.* 'Valorous' Exp. St. 12; 1450 fms. Also a single specimen from that Expedition.

## SUMMARY OF THE FOREGOING LIST.

Families.	Genera.	Number of Species.
IX. LITTORINIDÆ ( <i>continued</i> )	RISSEA .....	42
	HYDROBIA ....	2
X. PALUDINIDÆ .....	BITHYNIA .....	1
XI. HETEROPHROSYNIDÆ..	BARLEEIA .....	1
XII. SKENEIDÆ .....	HOMALOGYRA ..	1
XIII. VERMETIDÆ .....	SILIQVARIA.. ..	1

Families.	Genera.	Number of Species.
XIV. TURRITELLIDÆ .....	STILBE .....	1
	TURRITELLA....	2
	MESALIA .....	1
XV. SCALARIIDÆ .....	SCALARIA .....	21
	ACIRSA .....	1
	Total....	74

## FOURTH SUPPLEMENT.

I have been indebted to the kindness of Dr. Fischer for an opportunity of examining the Mollusca which were procured last summer by the deep-sea exploration in the French Government steamer 'Talisman' off the west coast of Spain and the coasts of Morocco, Senegal, Sahara, Cape de Verd Isles, Canaries, and Azores. This examination will be seen to have greatly enriched the present Supplement. I also wish to recognize the laborious care taken by the Marquis de Folin in his "trriage" of the sifted material from the deep dredgings in this Expedition.

## Part I., P. Z. S. 1878 :—

- Page 401. *Terebratula caput-serpentis*. Off Morocco, the typical form ('Talisman' Exp.); 65 fms. *Fossil*. Miocene: Madeira (Mayer). Pliocene: Siena (Pantanelli).  
 „ *Terebratula tuberata*. Off Morocco and Sahara ('Talisman' Exp.); 330–1261 fms.  
 P. 404 *Terebratula vitrea*, var. *minor*: off C. St. Vincent; var. *sphenoidea*: off Morocco ('Talisman' Exp.); 298–818 fms.  
 P. 407. *Terebratula septata*. Off Morocco, Sahara, and Canaries ('Talisman' Exp.); 331½–861 fms.  
 P. 411. *Platydia anomioides*. Off Sahara ('Talisman' Exp.); 347–478 fms. *Fossil*. Pliocene: Sicily (Seguenza).  
 „ *Megerlia truncata*. Off Morocco and Canaries ('Talisman' Exp.); 50–65 fms. As usual, abundant.  
 P. 402. *Atretia gnomon*. Off Morocco and Azores ('Talisman' Exp.); 1192–2199 fms.  
 P. 413. *Rhynchonella sicula*. Off C. St. Vincent ('Talisman' Exp.); 57½ fms. Plentiful.  
 P. 414. *Crania anomala*. Off the Sahara ('Talisman' Exp.); 1261 fms.  
 P. 415. *Discina atlantica*. Off Morocco ('Talisman' Exp.); 1192 fms.

## Part II., P. Z. S. 1879 :—

- P. 554. *Anomia ephippium*. *Fossil*. Miocene: Madeira (Mayer).  
 P. 555. *Anomia patelliformis*. Off Azores ('Talisman' Exp.); 43–76 fms.  
 P. 556. *Pecten pusio*. Off Canaries ('Talisman' Exp.); 99–188 fms.

- P. 557. *Pecten pes-felis*. Off Canaries and C. Verd I. ('Talisman' Exp.); 88-134 fms. Very large. *Fossil*. Miocene: Madeira (Mayer).
- P. 558. *Pecten philippii*. Off Canaries and Azores ('Talisman' Exp.); 43-76 fms.
- P. 560. *Pecten testæ*. Off Azores ('Talisman' Exp.); 43-76 fms. *Fossil*. Pliocene: Siena (Pantanelli).
- " *Pecten similis*. *Fossil*. Pliocene: Siena (Pantanelli).
- P. 561. *Pecten vitreus*. Off Morocco and Sahara ('Talisman' Exp.); 469-650 fms.
- " *Amussium fenestratum*. Off C. Verd I. ('Talisman' Exp.); 268-335 fms.: and var. *cancellata*, off Azores (same); 1622-2199 fms.
- P. 562. *Amussium lucidum*. Off Morocco, Sahara, and Azores ('Talisman' Exp.); 650-1429 fms.
- P. 562. *Lima sarsii*. Bay of Biscay ('Travailleur' Exp. 1882); 249 fms. Off West coast of Africa ('Talisman' Exp.); 1254 fms.
- P. 563. *Lima subovata*. Off Morocco ('Talisman' Exp.); 1192 fms. According to Brugnone not fossil at Palermo, but the young of *L. elliptica*.
- P. 564. *Lima loscombii*. Off Azores ('Talisman' Exp.); 43-76 fms.
- " *Lima hians*, var. *tenera*. Off Azores ('Talisman' Exp.); 43-76 fms.
- " *Lima excavata*. Off Sahara ('Talisman' Exp.); 185 fms. Fresh and apparently recent valves of an unusually large size, equal to that of the fossil specimens which Prof. Seguenza noticed from the Pliocene or Post-tertiary formation in Calabria and Sicily and named *L. gigantea*.
- P. 568. *Modiolaria nigra*. Norway (Storm); 3-4 fms.
- P. 569. *Dacrydium vitreum*. Off West coast of Africa ('Talisman' Exp.); 478 fms. *Fossil*. Post-tertiary: Greenock (Steel).
- P. 570. *Arca lactea*. *Fossil*: Miocene: Madeira (Mayer).
- " *Arca nodulosa*, var. *scabra*. Off West coast of Africa ('Talisman' Exp.); 754 fms.
- P. 571. *Arca tetragona*. Off Azores ('Talisman' Exp.); 43-76 fms.
- " *Arca noæ*. *Fossil*. Miocene: Madeira (Mayer).
- " *Arca antiquata*. Off Morocco ('Talisman' Exp.); 32½ fms.
- P. 573. *Arca frielei*. Off Morocco ('Talisman' Exp.); 635 fms.
- P. 574. *Leda minuta*. Norway (Storm); 300 fms.
- P. 575. *Leda fragilis*. Bay of Biscay ('Travailleur' Exp. 1882); 249 fms.
- " *Leda arctica*. Post-tertiary: N.W. Germany (Torell).
- P. 576. *Leda messanensis*. Off Morocco and the Azores ('Talisman' Exp.); 452-1514½ fms.

- P. 578. *Leda striolata*. Off West coast of Africa ('Talisman' Exp.); 452-1254 fms.  
 „ *Leda pusio*. Off Morocco ('Talisman' Exp.); 753-1192 fms.  
 P. 579. *Leda jeffreysi*. Off West coast of Africa and the Azores ('Talisman' Exp.); 452-2199 fms.  
 „ *Leda subæquilatera*. Off Azores ('Talisman' Exp.); 1622 fms.  
 P. 580. *Leda micrometrica*. Mediterranean (Nares); 150-300 fms.  
 „ *Leda insculpta*, var. *lævis*; nearly smooth. Off Azores ('Talisman' Exp.); 2199 fms.  
 P. 581. *Leda minima*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 „ *Nucula ægeensis*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 582. *Nucula corbuloides*. Mediterranean (Nares); 150-300 fms.  
 „ *Nucula tumidula*. Off West coast of Africa ('Talisman' Exp.); 681 fms.  
 P. 583. *Nucula sulcata*. Bay of Biscay ('Travailleur' Exp. 1882); 249 fms.  
 P. 585. *Limopsis aurita*. Off Morocco and Sahara ('Talisman' Exp.); 599-1429 fms. Very large from latter station.  
 „ *Limopsis cristata*. Off Morocco ('Talisman' Exp.); 658-861 fms.  
 „ *Limopsis minuta*. Off Morocco ('Talisman' Exp.); 298-650 fms.  
 P. 586. *Malletia obtusa*. Off Morocco and Senegal ('Talisman' Exp.); 298-1733 fms.  
 „ *Malletia cuneata*. Off Morocco and Sahara ('Talisman' Exp.); 599-1733 fms.

## Part III., P. Z. S. June 1881 :—

- P. 696. *Decipula ovata*. Off West coast of Africa ('Talisman' Exp.); 1254 fms.  
 P. 699. *Lasæapumila*. Off Azores ('Talisman' Exp.); 1514½ fms.  
 P. 701. *Lucina spinifera*. Off Canaries ('Talisman' Exp.); 99-188 fms.  
 „ *Lucina borealis*. Off Azores ('Talisman' Exp.); 43-76 fms.  
 „ *Axinus flexuosus*, var. *polygona*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 703. *Axinus croulinensis*. Off West coast of Africa ('Talisman' Exp.); 452-1254 fms.  
 „ *Axinus ferruginosus*. Off Sahara ('Talisman' Exp.); 452-1261 fms.  
 P. 704. *Axinus subovatus*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 „ *Axinus cycladius*. Off Sahara and Azores ('Talisman' Exp.); 1261-1622 fms.

- P. 705. *Cardita aculeata*. Off Morocco ('Talisman' Exp.); 95 fms.
- P. 706. *Cardium aculeatum*. Drontheim (Storm). A specimen 82 mm. (more than 3 inches) in size.
- P. 707. *Cardium papillosum*. Off Canaries and Azores ('Talisman' Exp.); 43-188 fms.
- P. 708. *Cardium fuscium*. Bay of Biscay ('Travailleur' Exp. 1882); 249 fms.
- P. 710. *Isocardia cor*, fry. Off Senegal and West coast of Africa ('Talisman' Exp.); 1192-1733 fms.
- P. 711. *Astarte sulcata*. Off Morocco (typical, intermediate, and variety *fusca*); 95 fms. Off Canaries (typical); 99-188 fms. 'Talisman' Exp. 1883.
- P. 713. *Circe minima*. Gibraltar B.; living in 3 fms.
- P. 714. *Venus rudis*. Off Morocco and Canaries ('Talisman' Exp.); 65-188 fms.
- „ *Venus effossa*. Off Morocco, Canaries, and Azores ('Talisman' Exp.); 43-188 fms.
- P. 715. *Venus multilamella*. Off Morocco ('Talisman' Exp.); 32½ fms.
- „ *Venus casina*. Off Canaries and Azores ('Talisman' Exp.); 43-113 fms.
- P. 718. *Tellina balaustina*. Off Morocco ('Talisman' Exp.); 65 fms.
- P. 720. *Tellina compressa*. BODY whitish: mantle having its fringed margin protruded beyond the edges of the valves: tubes 8-sided, as in *Tellina* and *Psammobia*; they are bulbous at the extremities. Off C. Sagres, in 45-58 fms.
- „ *Tellina serrata*. Off Morocco ('Talisman' Exp.); 32½ fms.
- P. 722. *Psammobia ferroensis*. Off Azores ('Talisman' Exp.); 43-76 fms.

Part IV., P. Z. S. November 1881:—

- P. 922. *Amphidesma castaneum*. Off Azores ('Talisman' Exp.); 43-76 fms. Off C. de Verd I. (same Exp.); 1977 fms.
- P. 926. *Scrobicularia longicallus*. Off C. Spartel, Morocco, Sahara, and Azores ('Talisman' Exp.); 337-2199 fms. It seems a pity that the worthless and nonsensical name *Syndosmya* should be retained by some conchologists for species of the established and consistent genus *Scrobicularia*. I have already endeavoured to show that *Syndosmya* is not founded on a single valid character and that it is long subsequent in point of date to Leach's generic name *Abra*, as well as to *Erycina* of Lamarek, which is apparently the same genus.
- „ *Scrobicularia alba*. Off Morocco and Azores ('Talisman' Exp.); 470-681 fms.

- P. 930. *Lyonsia formosa*. Off West coast of Africa ('Talisman' Exp.); 452-731 fms.
- P. 932. *Pecchiolia subquadrata*. Off Sahara ('Talisman' Exp.); 681-1261 fms. I overlooked other 'Porcupine' Stations for this species, viz. 1869: St. 16, 17. These specimens are larger than the size given in the description.
- „ *Pecchiolia insculpta*. Off West coast of Africa and Azores ('Talisman' Exp.); 478-681 fms. Very large and fine specimens.
- P. 933. *Pecchiolia angulata*. Off Morocco and Sahara ('Talisman' Exp.); 617-781 fms. An extraordinarily large valve from the latter station.
- „ *Pecchiolia acuticostata*. Off Morocco ('Talisman' Exp.); 650 fms. A large valve.
- P. 937. *Neæra subtorta*. Fossil. Post-tertiary: Garvel Park, Greenock (Scott and Steel).
- P. 938. *Neæra cuspidata*. Off Morocco ('Talisman' Exp.); 95-138 fms.
- „ *Neæra gracilis*. Off Morocco ('Talisman' Exp.); 599-1300 fms.
- „ *Neæra rostrata*. Off Morocco and Azores ('Talisman' Exp.); 470-1137 fms.
- P. 940. *Neæra depressa*. Off Sahara and the West coast of Africa ('Talisman' Exp.); 452-1261 fms.
- „ *Neæra lamellosa*. Off Sahara ('Talisman' Exp.); 1261 fms.
- P. 941. *Neæra contracta*. Off Morocco and Azores ('Talisman' Exp.); 1192-1622 fms. Mr. Dall now refers this species to his *N. limatula*, described in the Bulletin of the Museum of Comparative Zoology, vol. ix. No. 2, p. 112. His report is dated December 5, 1881. But in that description he says that his species is clearly not one of mine. He has since had an opportunity of comparing the types of both species.
- „ *Neæra semistrigosa*. Referred by Mr. Dall to his *N. lamellifera* in the same publication. My publication is dated Nov. 29, 1881.
- P. 942. *Neæra circinata*. Off Morocco ('Talisman' Exp.); 1138-1190 fms. Very fine specimens.
- „ *Neæra ruginosa*. Off West coast of Africa ('Talisman' Exp.); 452-1254 fms.
- P. 943. *Neæra curta*. Behring Sea ('Vega' Exp.); 65 fms., as *N. behringensis* of Dr. Leche. The sculpture of all the ribbed species of this genus is variable.
- P. 944. *Neæra striata*. Off Morocco ('Talisman' Exp.); 452-861 fms.
- P. 945. *Mya truncata*. Off C. St. Vincent ('Talisman' Exp.); 56 fms. A fresh-looking valve of a young specimen.

- P. 946. *Panopea plicata*. Madeira (Watson); 20 fms.; off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 947. *Pholas candida*. Drontheim (Storm).

Part V., P. Z. S., 1882:—

- P. 656. *Dentalium dentalis*. Fossil. Post-tertiary: Selsea.  
 P. 657. *Dentalium panormitanum*. C. St. Vincent, and off Senegal ('Talisman' Exp.); 32½–1723 fms.  
 P. 658. *Dentalium capillosum*. Off West coast of Africa and Azores ('Talisman' Exp.); 681–2711 fms. Very large and perfect from the latter locality.  
 „ *Dentalium candidum*. Off Morocco, Sahara, and Canaries ('Talisman' Exp.); 629–1429 fms. Very large and fine specimens.  
 „ *Dentalium agile*. Off C. Spartel, Morocco, Sahara, and Azores ('Talisman' Exp.); 337–650 fms. Very fine specimens.  
 P. 659. *Dentalium striolatum*. Bay of Biscay ('Travailleur' Exp.); 1062 fms. My note of the animal (as *D. abyssorum*) from 370 fathoms in the 'Porcupine' Expedition of 1869, is as follows:—"BODY cream-colour: mantle thick, with jagged but not ciliated edges: foot cylindrical and terminating in a conical point; lobes expansile, slightly scalloped at the edges; the upper part of the foot is pale yellowish brown: tentacles (or captacula) numerous, extremely slender and thread-like, with bulbous tips."  
 „ *Dentalium entalis*. Varangerfjord ('Coligny' Exp.).  
 P. 660. *Dentalium filum*. Off Sahara ('Talisman' Exp.); 1261 fms. A remarkably large and fine specimen.  
 P. 661. *Siphodentalium affine*. Off Azores ('Talisman' Exp.); 2199 fms.  
 P. 662. *Siphodentalium quinquangulare*. Bay of Biscay ('Travailleur' Exp.); 733 fms.  
 P. 663. *Cadulus olivi*. Off Senegal and West coast of Africa ('Talisman' Exp.); 470–1733 fms. A fine specimen from this Expedition has a double notch and corresponding points at the apex, as in *C. jeffreysi*. See the 5th volume of 'British Conchology,' p. 197.  
 „ *Cadulus gracilis*. Bay of Biscay ('Travailleur' Exp.), off West coast of Africa and Azores ('Talisman' Exp.); 681–1622 fms.  
 P. 664. *Cadulus cylindricus*. Off Azores ('Talisman' Exp.); 2199 fms.  
 „ *Cadulus propinquus*. Palermo (Monterosato), Bay of Biscay ('Travailleur' Exp.), off Morocco ('Talisman' Exp.); 108–1192 fms.  
 „ *Cadulus subfusiformis*. Off West coast of Africa ('Talisman' Exp.); 1254 fms.

- P. 665. *Cadulus jeffreysi*. Off West coast of Africa ('Talisman' Exp.); 478 fms.  
 „ *Cadulus tumidosus*. Off Morocco and West coast of Africa ('Talisman' Exp.); 478-1254 fms.  
 P. 668. *Chiton alveolus*. G. St. Lawrence (*Whiteaves*), G. Maine (*Verrill*); 150-200 fms.  
 P. 673. *Addisonia eccentricus*. Off Sardinia ('Washington' Exp., 1881); 217 fms. As to the change of name from *excentrica* to *eccentricus* I would refer to my remarks in page 122 of this paper.  
 „ *Lepetella tubicola*. A picturesque group of eight specimens, snugly resting in the hollow of an upper mandible of a large Cephalopod, was dredged last summer in the 'Talisman' Expedition off the Azores at the depth of 64 fathoms; and several specimens of apparently another and a larger species were also procured during the same Expedition off the Sahara in 1261 fathoms, and will be described by Dr. Fischer.  
 P. 674. *Propilidium pertenuis*. Off Sahara and West coast of Africa ('Talisman' Exp.); 1261 fms.  
 P. 675. *Puncturella profundis*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 680. *Emarginula multistriata*. Off Sahara ('Talisman' Exp.); 1261 fms.

## Part VI., P. Z. S. 1883:—

- P. 88. *Scissurella umbilicata*. Off Morocco ('Talisman' Exp.); 1192 fms.  
 P. 89. *Molleria costulata*. Off Morocco ('Travailleur' Exp.); 1062 fms.  
 „ *Molleria lævigata*. S.E. Greenland, 'Bulldog' Exp. (*Wallich*); 108 fms.  
 P. 91. *Cyclostrema trochoïdes*. With the last.  
 P. 93. *Cyclostrema bithynoides*. Palermo (*Monterosato*); 162½ fms.  
 „ *Cyclostrema spheroides*. Off Morocco ('Travailleur' Exp.); 640 fms.  
 „ *Tharsis romettensis*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 98. *Trochus ottois*. Off Morocco and Azores ('Talisman' Exp.); 631-1261 fms.  
 P. 99. *Trochus suturalis*. Off Sahara ('Talisman' Exp.); 222-1261 fms.  
 P. 102. *Trochus leucophæus*. After the words "omitted in" add "the index to."  
 P. 105. *Trochus exasperatus*. Fossil. Miocene. Maine-et-Loire (*Bardin*).  
 „ *Trochus wiseri*. Off Morocco ('Travailleur' Exp.); 1062 fms.

- P. 105. *Trochus miliaris*. Fossil. Miocene. Maine-et-Loire (Bardin).  
 P. 106. *Trochus zizyphinus*. Off Azores ('Talisman' Exp.); 43-76 fms.  
 P. 109. *Phasianella pulla*. Off Sahara ('Talisman' Exp.); 1261 fms. Most probably drifted.  
 P. 110. *Cithna tenella*, and var. *costulata*. Off Marocco and Azores ('Talisman' Exp.); 681-1622 fms.  
 P. 111. *Cithna carinata*. Off Sahara ('Talisman' Exp.); 1261 fms.  
 P. 141. *Iphitus*. Another species was procured during the same Expedition of the 'Talisman' in 681 fathoms off the West coast of Africa.

## EXPLANATION OF THE PLATES.

## PLATE IX.

- Fig. 1. *Rissoa fischeri*, p. 113.  
 2. — *parvula*, p. 114.  
 3. — *subsoluta*, p. 115.  
 4. — *testæ*, p. 115.  
 5. — *angulata*, p. 119.  
 6. — *turricula*, p. 120.  
 7. — *deliciosa*, p. 121.  
 8. — *affinis*, p. 124.  
 9. *Hydrobia compacta*, p. 128.

## PLATE X.

- Fig. 1. *Homalogyra densicostata*, p. 129.  
 2. *Stilbe acuta*, p. 130.  
 3. *Scalaria longissima*, p. 132.  
 4. — *vittata*, p. 133.  
 5. — *algeriana*, p. 134.  
 6. — *nana*, p. 134.  
 7. — *semidisjuncta*, p. 135.  
 8. — *acus*, p. 139.  
 9. — *tenera*, p. 139.  
 10. — *formosissima*, p. 140.  
 11. *Acirsa praelonga*, p. 141.
-

March 4, 1884.

E. W. H. Holdsworth, Esq., F.Z.S., in the Chair.

Mr. Howard Saunders exhibited an example of Sabine's Gull, *Xema sabinii*, shot last September in the Island of Mull, in the fully adult summer plumage so rarely seen in Great Britain. Mr. Saunders also exhibited an adult example in breeding-plumage of a rare straggler from North America, Bonaparte's Gull, *Larus philadelphia*, shot on Loch Lomond, about the end of April 1850, by Sir George H. Leith-Buchanan, Bart.

With regard to the specimen of the American Laughing Gull, *Larus atricilla*, in the British Museum, said to be the one obtained by Montagu at Winchelsea, in August 1774, he pointed out that it in no way agreed with Montagu's description, and was certainly not his bird.

Mr. Saunders further exhibited a specimen of the Dusky Shearwater, *Puffinus griseus* (Gm.), shot off Redcar by Mr. T. H. Nelson.

The following extracts from a letter addressed to the Secretary by Dr. Ch. W. Lütken, F.M.Z.S., was read:—

Zoological Museum,  
University of Copenhagen,  
15th Feb., 1884.

I take the liberty of placing before you a fact which has given me some reason to suppose that *Tachyglossus aculeatus*, Shaw (*T. hystrix*, auctt.), might possibly not be, as commonly supposed, the only species of the genus inhabiting the continent of Australia.

In the year 1848 a Mr. Bertelsen, returning from Australia (Sydney), offered us for sale several skins of Mammalia, mostly common and well-known species from south-east Australia. Among those purchased for the Zoological Museum, was a skin of a female *Tachyglossus* of the *hystrix* type, which was at that time entered in the catalogue as *T. hystrix*. During several years no special attention was paid to this specimen until 1883, when Mr. Winge, who was entrusted with the task of drawing up a catalogue of some parts of the collection of Mammalia, drew my attention to the fact that this skin could not be that of a true *T. aculeatus*. At the same time he hinted that it might possibly belong to the New-Guinean *T. lawesi*, described a few years ago by Mr. Ramsay (Proc. Linn. Soc. N.S.W. vol. ii. p. 32, 1878). The journal in which the original description of this species is given, does not exist here in Copenhagen. At that time, therefore, we were unable to verify this conjecture. Some time ago, however, the note inserted by M. Alph. Dubois in the 'Bulletin de la Société Zoologique de France' for 1881, in which this gentleman has had the appropriate idea of adding to his account of *Acanthoglossus bruijini* a fresh translation of the description of *T. lawesi*, happened to fall into my hands. Thus we were able to compare the

specimen bought in 1848 of Mr. Bertelsen with the description. This comparison leaves little doubt in our minds that our specimen is really one of the true *T. lawesi*, or of a nearly allied form. Its specific distinction from *T. aculeatus* is beyond all doubt.

That such an animal does not live in the neighbourhood of Sydney, where Mr. Bertelsen probably purchased his specimen, is evident, and though there were a few Malayan animals (a *Paradoxurus* and a *Tragulus*) in the collection, I can but think it very improbable that Mr. Bertelsen should have been able to obtain in 1848, at Sydney or thereabouts, a skin of a New-Guinean animal. I should rather think, therefore, that the specimen might possibly have been brought to Sydney from some other more or less distant part of Australia, say from Queensland, where it is now well known that the *Echidna* occurs. I am well aware that the Queensland *Echidna* has been described by competent observers as identical with the more southern *T. aculeatus*; but I should nevertheless venture to recommend a renewed examination of specimens of *Tachyglossus* in the British and Australian Museums, especially of specimens from Queensland and North Australia. The result might possibly be the discovery of a species inhabiting the north-eastern part of the Australian continent, different from the typical *T. aculeatus*, and closely related to, if not identical with, the *T. lawesi* of south-eastern New-Guinea. As renewed investigations are going on at this very moment, if I am not mistaken, in Australia concerning the reproduction of the Ornithodelphs, I do not delay longer to bring this suggestion, and the facts which have induced me to make it, to the knowledge of those who are especially interested in elucidating the specific characters and the geographical distribution of these animals.

The supposed specimen of *Tachyglossus lawesi* now before me is a rather large animal measuring 423 millim. in a straight line, the length of the snout from the eye to the point being 63 millim. The snout or rostrum is somewhat longer proportionally than in a male specimen of *T. aculeatus* also before me, the spines of the back longer and stronger, rufous-yellowish with black points. *Scarcely any hairs* are intermixed with the spines, much fewer than in *T. aculeatus*, *T. lawesi* being thus, of the whole family, the species best provided with an armature of spines, longer, stronger, and more densely placed than in any other. Also instead of being limited to the back above a horizontal line from the shoulder to the tail, the spines in this species descend on the flanks, though they do not quite reach the belly. Its most salient and unequivocal character, however, is the *different proportions of the hind claws*. In *T. aculeatus* there is a regular climax from the fifth continuously to the second longest claw, this exceeding the third only slightly in length, whereas in *T. lawesi* the three external claws increase only slightly in size from the fifth to the third, which is therefore much shorter than the second, this last claw being in fact more than double the length of the third.

I have extended this comparison to the hind bones and the incomplete crania extracted from the skins. The cranium of the

female *T. lawesi* is proportionately narrower, and its rostral portion longer than in the skull of the male *T. aculeatus*. Both specimens are quite adult; in the *T. lawesi*, which is the larger of the two, the limb-bones are, contrarily to what I expected, absolutely smaller, shorter, and more slender than in *T. aculeatus*. There is also a marked difference in the shape of the *processus olecranoides* of the fibula, narrow in *T. lawesi*, broad in *T. aculeatus*; but I am unable to decide whether these differences are merely sexual or specific.

---

Mr. J. E. Harting, F.Z.S., exhibited and made remarks on some horns of the Roe-deer (*Capreolus capræa*) from Dorsetshire, contrasting them with Scotch horns of the same species, with which they favourably compared. He remarked that Dorsetshire was now the only English county in which the Roe was to be found in a truly wild state, and detailed the steps which had been lately taken, under his direction, to transport a few pairs to Epping Forest, the conservators of that forest being desirous to introduce the animal into haunts where it had been once common, but had long become extinct. On the occasion referred to, a couple were secured for the Society's Menagerie, whither they were safely transferred, being presented by Mr. J. C. Mansel Pleydell, of Whatcombe, and Mr. C. Hambro', of Milton Abbey, in whose woods they were captured. The number of Roe-deer at present roaming in the Milton, Whatcombe, and Houghton Woods, which fringe the southern side of the Vale of Blackmore, from Stoke Wake to Melcombe Park and the Grange Wood westward, is estimated to be about 150.

From enquiries made of experienced keepers on the spot, Mr. Harting found that they discountenanced the generally accepted belief that the Roe is monogamous, asserting that in the breeding-season they often saw a buck consorting with two, and occasionally three does. As this did not tally with the statements of foresters in Scotland and Germany, where the habits of the Roe-deer have been attentively studied, Mr. Harting regarded it as an error of observation, believing that the animals seen with the buck in the rutting-season were probably a doe with a fawn or fawns, which would not breed.

In Dorsetshire the usual number of fawns produced at a birth is stated to be two, and these are dropped in April or the beginning of May, somewhat earlier than is the case with the Fallow Deer. In winter they are found scattered in little parties of three or four to ten or a dozen throughout the woods.

---

The following papers were read:—





2.



3.



1a.



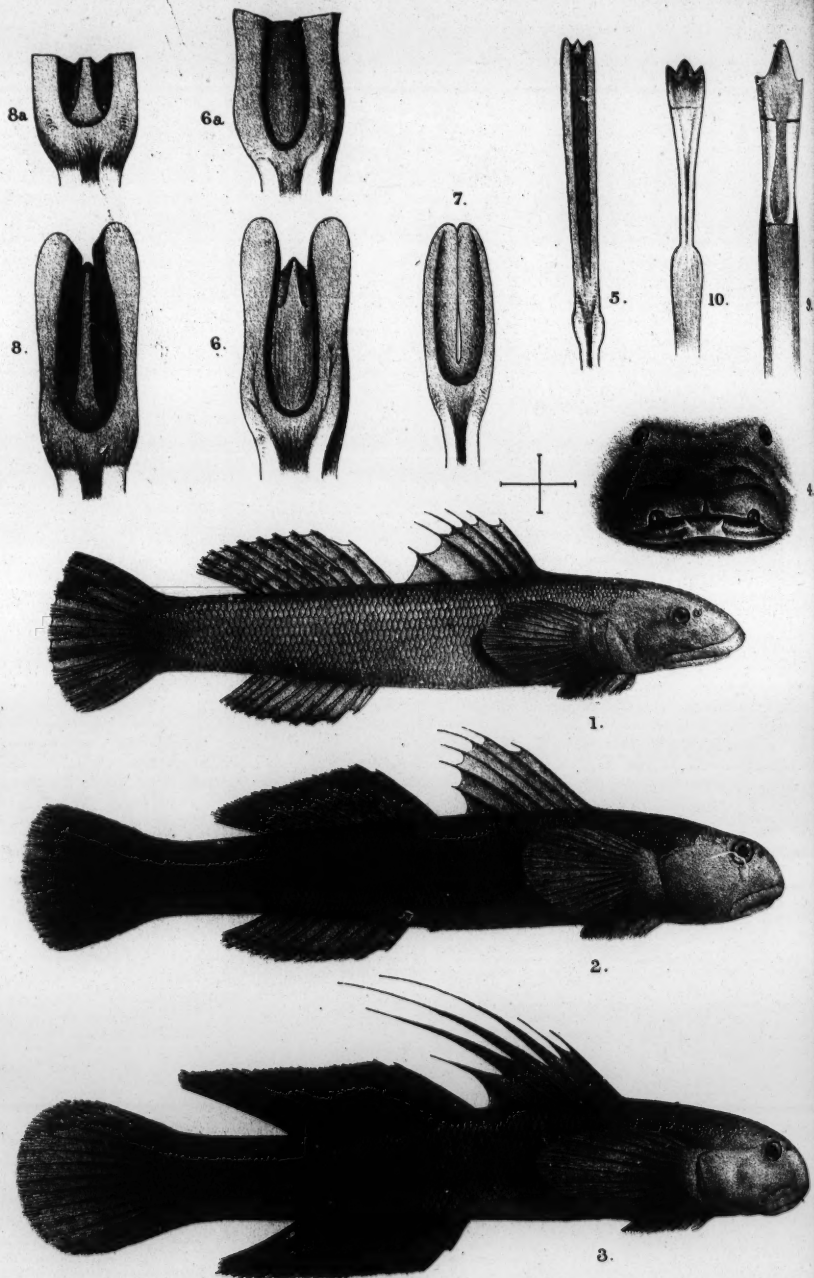
1.

1. 1A. SICYDIUM PLUMERI. 2. S. GYMNOGASTER. 3. S. PUGNANS.

R. Mearns del et lith.

Mearns Bros. Imp.





R. Minton & W.R.O. Grant.

Minton Bros. inc.

1. SICYDIUM BREVIFILIE. 2. S. SALVINI. 3. S. ANTILLARUM.  
4. S. STIMPSONI. 5-10. TEETH OF SICYDIUM & LENTIPES.

1. A Revision of the Fishes of the Genera *Sicydium* and *Lentipes*, with Descriptions of five new Species. By W. R. OGILVIE - GRANT. (Communicated by Dr. GÜNTHER, F.R.S., V.P.Z.S.)

[Received February 15, 1884.]

(Plates XI., XII.)

The fact that there are already as many as 19 species in the genus *Sicydium* (to which I have had to add 5) seems to justify an attempt to arrange the species into smaller groups, the members of which may be found to be allied together by some convenient and distinctive characters. Dr. Günther, in his British Museum Catalogue, divides this genus into two groups according as the anterior teeth are, or are not, enlarged in the lower jaw. Making a further use of the line of investigation which he here opened to us, I have taken advantage of the opportunity of examining the characters of the teeth in the specimens in the British Museum.

I find that the teeth of the upper jaw, when subjected to a magnifying power of some 200 diameters, are of one of four distinct forms, viz., unicuspid, bicuspid, and two kinds of tricuspid.

In the first group, or that in which the teeth are unicuspid, and of which *S. plumieri* may be taken as typical, the teeth (Plate XII. fig. 5) are simple, slender, with the distal half bent inwards at or nearly at right angles. In the second, or bicuspid group, as in *S. pugnans*, n. sp., the teeth (Plate XII. fig. 7) are curved inwards and have their extremities bilobed and shaped like the anterior part of a pig's hoof. In the third group, as an example of which a tooth of *S. gymnogaster*, n. sp., is figured (Plate XII. fig. 6), the teeth are tricuspid and trident-shaped, the lateral lobes long, the middle short and, as it were, suspended between the extremities of the former, so that it soon becomes worn away, and the tooth is then to all appearance bicuspid. I have not found these two last types of tooth in any as yet described species which I have had the opportunity of examining. In the fourth and last group, as in *S. tenuurum*, the teeth (Plate XII. fig. 8) are also tricuspid and trident-shaped; but all the lobes being of nearly equal length and strength, the teeth retain this shape until quite worn down.

SICYDIUM, C. & V.

*Sicydium*, Cuv. & Val. xii. p. 167; Günth. Cat. Fish. iii. p. 91 (part); Day, P. Linn. Soc. xiii. p. 140.

*Sicydium* et *Sicyopterus*, Gill. Proc. Ac. Nat. Sc. Philad. 1860, p. 101.

PROC. ZOOL. SOC.—1884, No. XI.

11

*Cotylophus*, Guich., in Maillard Notes sur l'Isle de la Réunion, ii. Addenda C. p. 9.

*Sicydium*, *Sicyopterus* et *Microsicydium*, Bleeker, Arch. Néerl. ix. p. 313.

*Sicyopterus*, *Sicydiops* et *Microsicydium*, Bleeker, Versl. Ak. Amst. (2) ix. p. 271.

Body subcylindrical, covered with rather small ctenoid scales; head oblong and broad, with the cleft of the mouth nearly horizontal; upper jaw prominent; snout obtusely rounded; lips very thick, the lower with a series of numerous slender horizontal teeth, of which sometimes only the extremities are visible. Upper jaw with a single uniform series of numerous moveable small teeth attached by ligament to the edge of the maxilla; behind this outer visible series lie numerous other parallel series of young teeth hidden in the gum, which succeed the former as they become worn out or broken. Lower jaw with a series of widely set conical teeth. Eyes of moderate size. Two dorsal fins, the anterior with 6 (5 or 7) flexible spines; caudal quite free; ventrals united into a short cup-shaped disk. Gill-openings of moderate width; 4 branchiostegals; no air-bladder. Pseudobranchiæ a slit behind the fourth gill.

This genus, confined to fresh waters near the sea, is found throughout the Torrid Zone.

#### *Synopsis of Species.*

I. Anterior mandibular teeth not larger than the following.

A. Teeth in the upper jaw long, slender, and bent inwards at, or nearly at, right angles.

a. Almost entirely hidden by the gum, dorsal spines produced into long ribands .....

1. *S. plumieri*.

b. Out the gum.

a. Maxilla does not extend to the vertical from the posterior margin of the eye; dorsal spines produced into long narrow ribands

2. *S. antillarum*.

β. Maxilla extends behind the vertical from the posterior margin of the eye; dorsal spines produced into short filaments .....

3. *S. brevifile*.

B. Teeth in the upper jaw curved, tricuspid, trident-shaped, the middle cusp, which is suspended at the anterior extremity of the tooth, being very short, soon becomes worn away.

a. Neck and belly naked .....

4. *S. gymnogaster*.

b. Neck and belly covered with small scales .....

5. *S. salvinii*.

C. Teeth in the upper jaw curved, tricuspid, trident-shaped, all the lobes being of nearly equal length and strength.

a. Head as broad as high; neck naked, uniform blackish, each scale with an oblong black spot. D.  $6\frac{1}{10}$  A.  $\frac{1}{10}$  .....

6. *S. acutipinne*.

b. Height of the head two thirds of the width; scales on the neck and belly as large as the rest, uniform blackish; caudal white-edged.

D.  $6\frac{1}{11}$  A.  $\frac{1}{10}$  .....

7. *S. laticeps*.\*

\* Specimens in which the teeth have not been examined.

## II. Anterior mandibular teeth larger than the following.

## A. Teeth in the upper jaw bicuspid.

- a. Margin of the upper lip serrate ..... 8. *S. pugnans*.

## B. Teeth in the upper jaw tricuspid.

## a. Scales subequal.

- a. First eight or ten rows on the occiput very small. Head four and a half in the length (without the caudal). Caudal with a dark horseshoe-like marginal band met by a second passing along the middle rays from the root. D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$  ..... 9. *S. tenuirum*.

- β. First two or three rows of scales on the occiput very small. Head five and a half in the length (without the caudal). Caudal with a dark horseshoe-like marginal band met by a second passing along the middle rays. D.  $6\frac{1}{11}$ . A.  $\frac{1}{11}$  ..... 10. *S. lagocephalum*.

- γ. Diameter of the eye is nearly equal to the interorbital space. D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$  ..... 11. *S. elegans* \*.

- δ. Diameter of the eye equals the interorbital space. The maxilla extends to the vertical from the middle of the eye.

- D.  $\frac{1}{11-12}$ . A.  $\frac{1}{10-11}$  ..... 12. *S. xanthurum* \*.

- e. Head and anterior portion of the trunk scaleless. Diameter of the eye equals the interorbital space. D.  $5-6\frac{1}{9-10}$ . A.  $\frac{1}{10-11}$  ..... 13. *S. gymnuchen* \*.

- ζ. A broad white band from the tip of the snout to the root of the caudal, below which is a longitudinal row of large black spots ..... 14. *S. albo-teniatum* \*.

- b. Scales on the middle of the trunk larger or much larger than those on the anterior parts and tail.

- a. Upper lip with a slight median cleft; caudal much shorter than the head, with a black horseshoe-like marginal band met by a second passing along its middle rays; the diameter of the eye is one third of the interorbital space. D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ .

- L. trans. 15 ..... 15. *S. micrurum*.

- β. Upper lip without median cleft; the last ray of the dorsal much produced, extending past the base of the caudal. Colour uniform black. D.  $6\frac{1}{10}$ . A.  $\frac{1}{11}$ . L. trans.

- 16 ..... 16. *S. nigrescens*.

- γ. Upper lip with a deep median cleft, and two round lateral notches below the nostrils. D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. trans. 13 ...

17. *S. stimpsoni*.

- δ. Upper lip with a slight median cleft; caudal longer than the head, olive with a yellow margin; diameter of the eye half the interorbital space; the maxilla extends to the vertical from the anterior

- margin of the eye. D.  $6\frac{1}{10-11}$ . A.  $\frac{1}{10-11}$ .  
 L. trans. 17 ..... 18. *S. cynocephalum*.  
 e. Caudal longer than the head, yellow with a broad violet band round the margin; diameter of eye about half the interorbital space; maxilla extends to the vertical from the middle of the eye. D.  $6\frac{1}{10-11}$ .  
 A.  $\frac{1}{10-11}$ . L. trans. 14 ..... 19. *S. parvei* \*.  
 ζ. The caudal is as long as the head and has a black horse-shoe-like marginal band; diameter of the eye more than half the interorbital space. D.  $6\frac{1}{11-12}$ . A.  $\frac{1}{10-11}$ .  
 L. trans. 14 ..... 20. *S. macrostetholepis* \*.  
 c. Scales on the neck and belly smaller than the rest, which are equal.  
 a. Maxilla extends to the vertical from the middle of the eye. Colour reddish brown, with six transverse bands and scattered spots of darker. D.  $6\frac{1}{10}$ . A. 11. L. trans. 19 ..... 21. *S. fasciatum* \*.  
 β. Maxilla extends to the vertical from the anterior margin of the eye; caudal one and a half times the length of the head; colour deep violet with longitudinal series of yellow spots. D.  $6\frac{1}{10-11}$ . A.  $\frac{1}{10-11}$ . L. trans. 15 ..... 22. *S. microcephalum* \*.  
 γ. Maxilla does not extend to the vertical from the middle of the eye. Colour brownish, with eight or nine rings surrounding the body. D.  $6\frac{1}{10}$ . A. 11 ..... 23. *S. griseum* \*.  
 d. First dorsal with seven spines.  
 α. Last ray of the dorsal only slightly produced into a short point; belly naked.  
 D.  $7\frac{1}{10}$ . A.  $\frac{1}{10}$  ..... 24. *S. parvipinne* \*.

*Anterior mandibular teeth not larger than the following.*

1. *SICYDIUM PLUMIERI*, Bl. (C. & V.). (Plate XI. fig. 1 et XII. fig. 5.)

*Gobius plumieri*, Bl. v. p. 125, pl. 178, fig. 3; Bl. Schn. p. 69; Lacép. ii. pp. 537 and 562, pl. 15, fig. 2.

*Sicydium plumieri*, Cuv. & Val. xii. p. 168; Gill, Proc. Ac. Nat. Sc. Philad. 1860, p. 101; Günth. Cat. Fish. iii. p. 92; Bleeker, Arch. Néerl. ix. p. 313.

D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. ca. 84.

Teeth in the upper jaw long, slender, and bent inwards at about right angles; only the extremities cut the gum. A single row of inconspicuous papillæ on the gum beneath the upper lip, with a larger median papilla above the maxillary suture; a median cleft in

the upper lip. Only the extremities of the horizontal teeth visible. Maxillæ contain an obtuse angle. The total length of the body (without the caudal) is four times the length of the head; the width of the head is considerably greater than the height and nearly equal to the length; the height of the body is two ninths of the length. Scales small; those on the body and tail are subequal and larger than those on the neck and belly. The diameter of the eye is one seventh of the length of the head and one third of the interorbital space. The length of the pectoral is greater than that of the head. The third, fourth, and fifth dorsal spines are produced into long ribands; the fourth, which is the longest, is about twice the height of the body. Colour either uniform olive-brown, dorsals with irregular dark marking and anal with a dark marginal band, or yellowish marbled with brown.

The largest specimen measures nearly 7 inches.

*Hab.* West Indies.

Nine specimens, adult, half-grown and young.

2. *SICYDIUM ANTILLARUM*, sp. n. (Plate XII. fig. 3.)

D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. 68.

Teeth in the upper jaw long, slender, and bent inwards over the gum at about right angles. A row of small lamelliform transverse papillæ on the gum beneath the upper lip, with a larger median lamelliform papilla above the maxillary suture; a slight median cleft in the upper lip; maxillæ at right angles to one another; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and three fifth times the length of the head; the width of the head is considerably greater than the height and two thirds of the length; the height of the body, which is equal to the width of the head, is one sixth of the length. Scales on the body and tail are subequal and larger than those on the neck and belly. The maxilla does not extend to the vertical from the posterior margin of the eye, the diameter of which is contained six and a half times in the length of the head and twice in the interorbital space. The length of the pectoral is greater than that of the head. The third, fourth, and fifth dorsal spines are produced into long narrow ribands; the fourth, which is longest, is nearly three times the height of the body; the second dorsal is considerably higher than the body. Colour uniform violet-brown, dorsal fins with irregular wavy dark markings; anal with a black and white marginal band; caudal with a dark band on the upper margin.

Total length  $4\frac{3}{4}$  inches.

*Hab.* Barbadoes.

One adult specimen.

3. *SICYDIUM BREVIFILE*, sp. n. (Plate XII. fig. 1.)D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. 64.

Teeth in the upper jaw long, slender, and bent inwards over the gum at right angles. No papillæ on the gum beneath the upper lip, but a small median papilla above the maxillary suture; upper lip with a slight median notch; maxillæ contain an angle of about  $75^\circ$ ; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and two fifth times the length of the head; the width of the head is greater than the height and two thirds of the length; the height of the body, which is greater than the width of the head, is contained five and a half times in the length. Scales on the body and tail are subequal, larger than those on the neck and belly. The maxilla extends behind the vertical from the posterior margin of the eye, the diameter of which is contained six and a half times in the length of the head and twice in the interorbital space. The length of the pectoral is less than that of the head. The second, third, fourth, and fifth dorsal spines are produced into short slender filaments; the fourth, which is the longest, is rather higher than the body; the second dorsal is not so high as the body. Colour, body and fins yellowish brown; the second dorsal marbled with darker; anal with a brown and white margin.

Total length  $4\frac{1}{8}$  inches.

*Hab.* Cameroons.

One adult specimen.

4. *SICYDIUM GYMNOGASTER*, sp. n. (Plate XI. fig. 2 et XII. fig. 6.)D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. 60-64.

Teeth in the upper jaw tricuspid; the middle cusp, which is situated at the anterior end of the tooth, is very short and soon becomes worn away.

A double or treble row of small papillæ on the gum beneath the upper lip, without a larger median papilla; upper lip with a very slight median notch; maxillæ contain an angle of about  $75^\circ$ ; horizontal teeth more or less inconspicuous.

The total length of the body (without the caudal) is four and a half to five times the length of the head; the height and width of the head are subequal and two thirds of the length. The height of the body is contained from five and a half to six times in the length. Scales strongly ctenoid; neck and belly naked. The diameter of the eye is one sixth of the length of the head and half the interorbital space. The length of the pectoral is greater than that of the head. The second, third, and fourth dorsal spines are produced into filaments; the third, which is the longest, is twice the height of the body; the second dorsal is higher than the body. Colour violet-brown, yellowish in young specimens, shaded with indistinct transverse bands of darker; an irregular brown spot on the axis of the pectoral, and a broad dark band from the base of the pectoral to the

root of the caudal, both more or less indistinct in adult specimens. Fins violet, clouded with darker.

The largest specimen measured  $4\frac{3}{4}$  inches.

*Hab.* Mazatlan.

Six specimens—adult, half-grown, and young.

5. *SICYDIUM SALVINI*, sp. n. (Plate XII. fig. 2.)

D.  $6\frac{9}{10}$ . A.  $\frac{1}{10}$ . L. lat. 78.

Teeth in the upper jaw tricuspid; the middle cusp, which is situated at the anterior end of the tooth, is very short and soon becomes worn away.

Gum beneath the upper lip smooth; a median papillose tubercle above the maxillary suture; upper lip with a small median notch; maxillæ contain an angle of about  $75^\circ$ ; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and three quarter times the length of the head; the width of the head is greater than the height and three quarters of the length. The height of the body is contained six and a quarter times in the length. Scales ctenoid, those on the neck and belly smaller than those on the body and tail. The diameter of the eye is contained five and a half times in the length of the head and twice in the interorbital space. The length of the pectoral is rather greater than that of the head. The second and third dorsal spines are subequal and produced into short filaments, one and a half times the height of the body; second dorsal not so high as the body. Colour olive-brown; anal yellow, with a black and white band along the margin; membrane of the second dorsal clear spotted with brown; caudal with a dark and yellow band round the extremity.

Total length  $4\frac{3}{4}$  inches.

*Hab.* Panama.

One adult specimen.

6. *SICYDIUM ACUTIPINNE*, Guich.

*Cotylopus acutipinnis*, Guich., in Mallard, Notes sur l'Isle de la Réunion, ii. Add. C, p. 10; Bleeker, Arch. Néerl. ix. p. 313.

D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ . L. lat. ca. 56. L. trans. ca. 18.

Teeth in the upper jaw tricuspid, comparatively large. Gum beneath the upper lip smooth; no median papilla above the maxillary suture; no cleft in the upper lip; maxillæ contain an obtuse angle; horizontal teeth inconspicuous.

The total length of the body (without the caudal) is five and two thirds the length of the head; the height and width of the head are subequal and rather less than two thirds of the length; the height of the body is about one seventh of the total length. Scales strongly ctenoid on the sides of the body. Head, neck, and belly naked. The diameter of the eye is one fifth the length of the head; maxilla extends to the vertical from the anterior margin of the eye. The

length of the pectoral equals the length of the head; caudal large, one fifth of the total length. The last ray of the dorsal and anal fins is produced into a short filament, especially that of the former, which extends past the base of the caudal. Colour deep black, lighter on the sides and whitish on the belly; a black oblong spot on each scale, most distinct on the posterior part of the body; dorsal and anal fins black, with large spots of darker, and the latter with a black marginal band; pectoral grey, with a blackish edge; caudal black.

*Hab.* Bourbon.

One adult specimen. (We owe this specimen, determined by Guichenot, to the kindness of M. Vaillant.)

7. *SICYDIUM LATICEPS*, C. & V.

*Sicydium laticeps*, Cuv. & Val. xii. p. 177; Günth. Cat. Fish. iii. p. 93.

$$D. 6\frac{1}{11}. \quad A. \frac{1}{10}.$$

The height of the head is two thirds of the width. Teeth in the lower jaw subequal. Scales on the neck and belly nearly as large as the others. The third and fourth dorsal spines are produced into subequal filaments, half as high again as the body. Uniform blackish, caudal white-edged. The longest specimen measures four inches. (*C. & V.*)

*Hab.* Bourbon.

*Anterior mandibular teeth larger than the following.*

8. *SICYDIUM PUGNANS*, sp. n. (Plate XI. fig. 3 et XII. fig. 7.)

$$D. 6\frac{1}{10}. \quad A. \frac{1}{10}. \quad L. \text{ lat. } 60. \quad L. \text{ trans. } 15.$$

Teeth in the upper jaw bicuspid.

Gum beneath the upper lip smooth; no median papilla; edge of the upper lip saw-like; maxillæ contain a narrow angle of about 45°; horizontal teeth conspicuous.

The length of the body (without the caudal) is four and four fifth times the length of the head; the width of the head is greater than the height and two thirds of the length. The height of the body is contained six and a half times in the length. Scales on the body and tail subequal, larger than those on the neck and belly. The diameter of the eye is one fifth of the length of the head and half the interorbital space. The length of the pectoral equals the length of the head. The dorsal spines are filiform; the fourth, which is the longest, is three times the height of the body; second dorsal higher than the body. Colour, body and fins olive-brown, belly bluish grey; seven dark blotches on the upper half of the body, two below the first dorsal, three below the second, one on the free part of the tail, and the last on the upper part of the root of the caudal; a deep black mark below the eye; second dorsal sometimes spotted with

brown; lower margin of the pectoral white-edged; caudal with a dark brown and white band on the upper and lower margins.

The largest specimen measures  $2\frac{1}{2}$  inches.

*Hab.* Savaii.

Many specimens—adult, half-grown, and young.

9. *SICYDIUM TÆNIURUM*, Gthr.

*Sicydium lagocephalum* (non Pall.), Kner, SB. Ak. Wien, lviii. p. 327.

*Sicydium macrostetholepis*, Günth. Cat. Fish. iii. p. 94.

*Sicydium tæniurum*, Günth. Fische der Südsee, p. 183, pl. cxii. fig. C.

D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ . L. lat. 54. L. trans. 16.

Teeth in the upper jaw tricuspid.

A row of rather large tuberculous papillæ on the gum beneath the upper lip, with larger elongate median papilla above the maxillary suture; upper lip with a median cleft; maxillæ contain an angle of about  $75^\circ$ ; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and a half times the length of the head; the width and height of the head are subequal and two thirds of the length. The height of the body is contained four and three quarter times in the length. Scales subequal and rather large, except the first eight or ten rows on the occiput. The diameter of the eye is contained five and a half times in the length of the head and two and a half in the inter-orbital space. The length of the pectoral is greater than the length of the head; the length of the caudal is less than one fourth of the total length of the body. The third dorsal spine is produced into a filament one and a half times the height of the body. Colour, body and fins uniform brownish; second dorsal with several transverse rows of dots on the rays; caudal with dark horseshoe-like marginal band met by a second passing along its middle rays from the root.

The largest specimen measures  $3\frac{1}{2}$  inches.

*Hab.* Aneiteum; Viti Levu.

Five adult specimens (types).

10. *SICYDIUM LAGOCEPHALUM*, Pall.

*Gobius lagocephalus*, Pall. Spicil. Zool. viii. p. 14, pl. 2. figs. 6-7.

*Sicydium lagocephalum*, Cuv. & Val. xii. p. 174; Günth. Cat. Fish. iii. p. 92; Kner, 'Novara,' Fische, p. 181.

D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ .

Teeth in the upper jaw tricuspid; a row of papillæ on the gum beneath the upper lip, with a larger median papilla above the maxillary suture; maxillæ contain an angle of about  $75^\circ$ .

Horizontal teeth conspicuous; upper lip with a median cleft.

The total length of the body is five and a half times the length of the head; the width and height of the head are equal. The

scales on the neck and belly are as large as the rest; those on the occiput very small. The diameter of the eye is contained four and a half times in the length of the head, one and a half in the interorbital space, and one and a half in the snout. The first dorsal is higher than the body; third and fourth spines are produced into short filaments. Colour brown, sometimes clouded with darker; fins brownish, except the ventral, which is whitish; second dorsal with four or five series of dark dots on the rays; anal with a black and white margin. Caudal with a dark horseshoe-like marginal band met by a second passing along its middle rays.

*Hab.* Mauritius and Bourbon.

One adult specimen.

11. *SICYDIUM ELEGANS*, Steind.

*Sicydium elegans*, Steindachner, SB. Ak. Wien, lxxx. p. 152.

B.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ . L. lat. 32-33.

(Teeth in the upper jaw tricuspid ?)

The total length of the body is five times the length of the head. The width of the head is greater than the height and is two thirds of the length. The height of the body is about one sixth of the length. Scales on the neck and belly are rather smaller than the rest. The diameter of the eye equals the length of the snout and is nearly equal to the interorbital space; it is contained about  $3\frac{1}{2}$  times in the length of the head. The first and second dorsals are higher than the body. The length of the pectoral is greater than that of the head and equal to the caudal. Colour light brownish-yellow; whitish on the belly, a dark brown band along the upper margin of the body, a second along the margin of the belly, and a third along the margin of the upper lip which loses itself between the eye and the base of the pectoral in small spots. The upper band extends along the side of the head to the snout in a horizontal line: above this, there is sometimes a third longitudinal band, which is joined to the corresponding one on the other side by a silver band which loses itself on the neck. All the fins with the exception of the ventral are transparent, spotted with violet. The spots on the caudal are larger than those on the other fins, and placed in oblique series.

Longest specimen 33 millim. long (*Steind.*).

*Hab.* Society Islands.

12. *SICYDIUM XANTHURUM*, Bleeker.

*Sicydium xanthurum*, Bleeker, Sumatra, ii. p. 271; Günth. Cat. Fish. iii. p. 93.

*Sicyopterus (Sicydiops) xanthurus*, Bleeker, Arch. Néerl. Sc. Nat. ix. p. 26; et Versl. Ak. Amst. (2) ix. p. 283.

D.  $6\frac{1}{11-12}$ . A.  $\frac{1}{10-11}$ . L. lat. 50. L. trans. 12.

(Teeth in the upper jaw tricuspid ?)

A row of papillæ on the gum beneath the upper lip; horizontal teeth conspicuous.

The total length of the body (without the caudal) is about five times the length of the head; the width of the head is rather greater than the height and two thirds of the length. The height of the body is contained about six and a half times in the length. Scales on the neck and side nearly equal to those on the tail. The diameter of the eye is contained three and a half times in the length of the head, and equals the interorbital space. The maxilla extends to the vertical from the middle of the eye. The pectoral and caudal fins are rather longer than the head; the caudal is contained about five and a half times in the total length. The third dorsal spine is produced into a short filament higher than the body second dorsal higher than the body. Colour blackish violet, dorsal and anal fins dusky violet; pectoral greenish violet with an orange margin; caudal yellow, with a black horseshoe-like mark, and with the angles violet.

Total length  $2\frac{1}{2}$  inches (*Bleek.*).

*Hab.* Rivers of West Sumatra and Bali.

### 13. SICYDIUM GYMNAUCHEN, Bleeker.

*Sicydium gymnauchen*, Bleeker, Act. Soc. Sc. Indo-Nederl. iii. Celebes, p. 11; Günth. Cat. Fish. iii. p. 95.

*Microsicydium gymnauchen*, Bleeker, Arch. Néerl. ix. p. 34; Versl. Ak. Amst. (2) ix. p. 284.

D.  $6\frac{1}{9-10}$ . A.  $\frac{1}{10-11}$ . L. lat. 40. L. trans. ca. 12.

(Teeth in the upper jaw tricuspid?)

Horizontal teeth conspicuous.

The total length of the body (without the caudal) is rather more than four times the length of the head; the width and height of the head are subequal and half the length. The height of the body is contained about six times in the length. Head and anterior portion of the trunk scaleless; scales on the rest of the body subequal. The diameter of the eye is about a quarter of the length of the head and equals the interorbital space. The length of the pectoral is rather less than the length of the head, which is about equal to the length of the caudal. The anterior dorsal is not so high as the body; the second dorsal and anal are subequal, higher than the first dorsal, their anterior rays being higher than the posterior. Colour green above, yellowish beneath, with eight blackish cross bands, broader than the intervening spaces; the last four or five are lighter than the rest and descend obliquely forwards; fins rose-coloured, anal dotted with black. (The bands are sometimes indistinct or absent.)

Out of more than 300 specimens the longest measures  $1\frac{1}{2}$  inches (*Bleek.*).

*Hab.* Estuaries of Manado.

*SICYDIUM*, sp. n.?

Closely allied to *S. gymnauchen*, Bleek.

D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ . L. lat. 54. L. Trans. 15.

Teeth in the upper jaw tricuspid.

No papillæ on the gum beneath the upper lip, no median papilla, slight median notch in the upper lip; maxillæ contain a narrow angle about  $45^\circ$ , horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and a half times the length of the head. The width and height of the head are subequal and half the length of the head. The height of the body is less than one sixth of the length. Scales subequal, rather large. The diameter of the eye is a quarter of the length of the head and is equal to the interorbital space. The length of the pectoral is less than the length of the head, which is equal to the length of the caudal. The first dorsal has none of its spines produced into filaments, and is equal to the height of the body. Second dorsal not so high as the body. Colour yellowish brown, a dark zigzag band along the upper half of the body. Membrane of the fins transparent; a dark W-shaped mark on the root of the caudal, and two transverse bands across the rays. The longest specimen measures  $1\frac{1}{4}$  inch (32 millims.).

*Hab.* Samoa.

Nine young specimens.

14. *SICYDIUM ALBO-TENIATUM*, Gthr.

*Sicydium albo-teniatum*, Günth. Fische der Südsee, p. 185, pl. ex. fig. D.

This species is described from a drawing made by Mr. Garrett, who captured two specimens in the streams of the Sandwich Islands.

The formula of the fins appears to be:—

D. 6, 15. A. 18.

Colours, body olive-green, with a broad white band from the tip of the snout to the root of the caudal, and below it a longitudinal row of large dark and isolated spots; fins greyish, second dorsal, caudal, and anal with a pale blue margin, the latter being also spotted with blue along the base; pectoral with a light edge.

*Hab.* Sandwich Islands.

15. *SICYDIUM MICRURUM*, Bleek.

*Sicydium micrurum*, Bleeker, Amboina, v. p. 341; Günth. Cat. Fish. iii. p. 93.

*Sicyopterus micrurus*, Bleeker, Versl. Ak. Amst. (2) ix. p. 280.

D.  $6\frac{1}{11}$ . A.  $\frac{1}{10}$ . L. lat. 55–60. L. trans. ca. 15.

Teeth in the upper jaw tricuspid.

A row of tuberculous papillæ on the gum beneath the upper lip,

a small median papilla above the maxillary suture, upper lip with a slight median cleft; maxillæ contain an angle of about  $60^{\circ}$ ; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and two third times the length of the head; the width and height of the head are equal and two thirds of the length. The height of the body is about a quarter of the length. Scales rather large, those on the neck, belly, and tail being smaller than the rest. The diameter of the eye is contained five and a half times in the length of the head and about three in the interorbital space. The length of the pectoral equals the length of the head; the length of the caudal is about one sixth of the total length of the body. The third dorsal spine is produced into a short filament not so high as the body; second dorsal not so high as the body. Colour greenish above, with eight blackish cross bars; a blackish band along the side, most distinct on the base of the caudal and along its middle rays; dorsal and anal fins immaculate, the latter with a blackish intermarginal band; caudal with a black horseshoe-like mark; pectoral and ventral yellow.

Total length  $3\frac{4}{10}$  inches.

Hab. Amboina.

One adult specimen.

16. *SICYDIUM NIGRESCENS*, Gthr.

*Sicydium nigrescens*, Günth. 'Challenger' Shore Fishes, p. 60, pl. xxvi. fig. C.

D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. 80. L. trans. 16.

Teeth in the upper jaw tricuspid.

Gum beneath the upper lip smooth, no median papilla above the maxillary suture; no median cleft in the upper lip; maxillæ are at right angles to one another; horizontal teeth conspicuous. The length of the body (without the caudal) is four and a half times the length of the head; the width of the head is rather greater than the height. The height of the body is one fifth of the length. Scales on the occiput, anterior part of body and belly in irregular series and much smaller than those on the rest of the body. The pectoral is considerably, and the caudal much longer than the head. The diameter of the eye is one seventh of the length of the head and rather more than one third of the interorbital space. The first, second, and third dorsal spines are produced into filaments, the third, which is the longest, is nearly twice the height of the body; second dorsal higher than the body; the posterior rays are much produced, extending beyond the root of the caudal. Colour uniform brownish-black; vertical fins black; pectoral and ventral brown.

Total length nearly 5 inches.

Honolulu.

One adult specimen (type).

17. *SICYDIUM STIMPSONI*, Gill. (Plate XII. fig. 4.)

*Sicyopterus stimpsoni*, Gill, Proc. Ac. Nat. Sc. Philad. 1860, p. 101; Bleeker, Arch. Néerl. ix. p. 313.

*Sicydium stimpsoni*, Günth. Cat. Fish. iii. p. 93; Günth: Fische der Südsee, p. 183.

D.  $6\frac{1}{10}$ . A.  $\frac{1}{10}$ . L. lat. 70.

Teeth in the upper jaw tricuspid.

A row of rather large tuberculous papillæ on the gum beneath the upper lip, with a larger median papilla above the maxillary suture; upper lip with deep median cleft and two round lateral notches below the nostrils; maxillæ at right angles to one another; horizontal teeth conspicuous.

Head subquadrate, rather less than one fourth of the length of the body (without the caudal); width of the head rather greater than the height and two thirds of the length. The height of the body is more than one fifth of the length. The length of the pectoral is equal to the length of the head; length of the caudal greater. The diameter of the eye is one sixth of the length of the head and one third of the interorbital space. Scales on the middle of the trunk very large, much larger than those on the neck, belly, anterior part of the body, and tail. The third and fourth dorsal spines are produced into filaments; the third which is the longest, is more than twice the height of the body; second dorsal not so high as the body. Colour purplish, with from seven to ten darker cross bands; caudal and base of dorsal and anal white-dotted.

The largest specimen measures  $3\frac{3}{8}$  inches.

*Hab.* Honolulu; Hawaii.

Four adult and half-grown specimens (types of *S. nigrescens*, juv.).

18. *SICYDIUM CYNOCEPHALUM*, C. & V.

*Gobio pinna ventrali subrotunda*, &c., Koelreuter, Nov. Comm. Petrop. ix. p. 428, pl. 9. fig. 3, 4.

*Sicydium cynocephalum*, Cuv. & Val. xii. p. 177, pl. 352; Bleeker, Batjan. ii. p. 201; et Natuurk. Tydschr. Ned. Ind. 1859, p. 156; Günth. Cat. Fish. iii. p. 94.

*Sicydium lagocephalum* (non Pall.), Bleeker, Natuurk. Tydschr. Ned. Ind. i. p. 250.

*Sicydium parvei* (non Bleek.), Günth. Cat. Fish. iii. p. 94.

*Sicyopterus cynocephalus*, Bleeker, Versl. Ak. Amst. (2) ix. p. 275.

D.  $6\frac{1}{10-11}$ . A.  $\frac{1}{10-11}$ . L. lat. 75-80. L. trans. ca. 17.

Teeth in the upper jaw tricuspid.

A row of small papillæ on the gum beneath the upper lip, a small median papilla above the maxillary suture; upper lip with a very slight median cleft; maxillæ contain an angle of about 60°; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and a half times the length of the head; the width of the head is rather

greater than the height and about two thirds of the length. The height of the body is about one fifth of the length. Scales on the side larger than those on the tail, and much larger than those on the anterior part of the body and occiput. The diameter of the eye is one sixth of the length of the head and half the interorbital space. The maxilla extends to the vertical from the posterior margin of the eye. The length of the pectoral is greater than the length of the head; the length of the caudal is contained four times and one third in the total length of the body. The third dorsal spine is produced into a short filament rather higher than the body; second dorsal not so high as the body. Colour, body above deep violet or greenish violet, below whitish or yellowish, with six or seven broad oblique bands of darker more or less indistinct; dorsal and anal fins orange, second dorsal sometimes with large regular brown spots on the rays; anal with a broad violet margin. Caudal olive, with the superior and inferior edges yellow; pectoral yellow-edged.

The largest specimen measures  $4\frac{9}{10}$  inches.

*Hab.* Moluccas; rivers of the East Indian Archipelago.

Three adult specimens.

#### 19. SICYDIUM PARVEI, Bleeker.

*Sicydium parvei*, Bleeker, *Natuurk. Tydschr. Ned. Ind.* iv. 1853, p. 427.

*Sicyopterus parvei*, Bleeker, *Versl. Ak. Amst.* (2) ix. p. 277; et *Arch. Néerl.* ix. p. 313.

D.  $6\frac{1}{10-11}$ . A.  $\frac{1}{10-11}$ . L. lat. 70. L. trans. ca. 14.

(Teeth in the upper jaw tricuspid?)

A row of papillæ on the gum beneath the upper lip; horizontal teeth conspicuous.

The total length of the body (without the caudal) is about four and a half times the length of the head; the width of the head is rather greater than the height, and two thirds of the length. The height of the body is less than one fifth of the length. Scales on the nape, shoulder, and belly cycloid, rest ctenoid; those on the side rather larger than those on the tail, and much larger than those on the anterior parts. The diameter of the eye is a quarter or one fifth of the length of the head, and about half the interorbital space. The maxilla extends to the vertical from the middle of the eye. The length of the pectoral is greater than that of the head; the length of the caudal is about one fifth of the total length of the body. The third dorsal spine is rather higher than the body. Colour, body blackish-violet, becoming lighter below; caudal yellow, with a broad violet band round the margin; the other fins brownish-violet.

The largest specimen measures  $4\frac{3}{4}$  inches (*Bleek.*).

*Hab.* Rivers of Garut, West Java.

20. *SICYDIUM MACROSTETHOLEPIS*, Bleeker.

*Sicydium macrostetholepis*, Bleeker, Sumatra, ii. p. 271; Kner, SB. Ak. Wien, lviii. p. 327.

*Sicyopterus macrostetholepis*, Bleeker, Versl. Ak. Amst. (2) ix. p. 281.

D.  $6\frac{1}{11-12}$ . A.  $\frac{1}{10-11}$ . L. lat. 50. L. trans. 14-15.

(Teeth in the upper jaw tricuspid?)

A row of papillæ on the gum beneath the upper lip; horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and a half times the length of the head; the width of the head is greater than the height and three quarters of the length. The height of the body is rather more than one sixth of the length. Scales on the anterior part of the body much larger than those on the neck, posterior part of the body, and tail. Diameter of the eye is about one fifth of the length of the head, and rather more than half the interorbital space. The maxilla extends to the vertical from the posterior margin of the eye. The lengths of the pectoral, caudal, and head are subequal; the length of the caudal is contained about five and a half times in the total length. The second, third, and fourth dorsal spines are produced into short filaments; the third, which is the longest, is higher than the body. Second dorsal higher than the body. Colour blackish-green above, becoming lighter below. Five or six dark transverse bands on the back; fins brownish-purple; dorsal fins sometimes with numerous irregular black dots, anal with a black marginal band; caudal black-spotted with a horseshoe-like black mark; pectoral yellow-edged.

The largest specimen measures  $4\frac{1}{10}$  inches (Bleek.).

Hab. Rivers of West Sumatra, Bali, Amboina, and Singapore.

21. *SICYDIUM FASCIATUM*, Day.

*Sicydium fasciatum*, Day, Journ. As. Soc. Beng. (n. s.) xliii. p. 31, et Fishes of India, p. 299, pl. lxiv. fig. 7.

D.  $6\frac{1}{10}$ . A. 11. L. lat. 67. L. trans. 19.

(Teeth in the upper jaw tricuspid?)

Horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and a quarter times the length of the head; the width of the head is greater than the height, and rather less than two thirds of the length. The height of the body is contained four and a half times in the length. Scales strongly ctenoid, somewhat irregularly arranged; they extend forwards nearly as far as the eyes; those on the neck and belly smaller than the rest, and more or less cycloid. The diameter of the eye is contained four and a half times in the length of the head, once and three quarters in the interorbital space, and once and a half in the snout. The length of the pectoral and caudal is subequal, nearly as long as the head; the caudal is contained five

and a half times in the total length. Dorsal spines short, projecting above the membrane; the fourth, which is the longest, is not so high as the body; second dorsal not so high as the body. Colour reddish-brown, with about six vertical darker bands on the body, wider than the ground-colour; there are also some dark spots; its under surface is dirty yellowish brown; fins nearly black, with a light, nearly white edge.

The largest specimen measures  $2\frac{1}{4}$  inches (*Day*).

*Hab.* Burmah.

## 22. SICYDIUM MICROCEPHALUM, Bleeker.

*Sicydium microcephalum*, Bleeker, Java, ii. p. 437; Günth. Cat. Fish. iii. p. 95.

*Sicyopterus microcephalus*, Bleeker, Versl. Ak. Amst. (2) ix. p. 278.

D.  $6\frac{1}{10-11}$ . A.  $\frac{1}{10-11}$ . L. lat. 60. L. trans. 15-16.

(Teeth in the upper jaw tricuspid?)

A row of papillæ on the gum beneath the upper lip; horizontal teeth conspicuous.

The total length of the body (without the caudal) more than five times the length of the head; the width of the head is greater than the height, and four-fifths of the length. The height of the body is more than one sixth of the length. Scales on the occiput, neck, and anterior part of the body much smaller than the rest. The diameter of the eye is about one fourth the length of the head, and one half the interorbital space. The maxilla extends to the vertical from the anterior margin of the eye. The length of the pectoral is greater than the length of the head; the length of the caudal is one and a half times the length of the head, and is contained four and a half times in the total length. The second, third, and fourth dorsal spines are produced into subequal filaments considerably higher than the body; second dorsal higher than the body. Colour, body deep violet above, with longitudinal series of yellow spots, yellowish below; dorsal, caudal, and pectoral fins violet, irregularly dotted with black; pectoral yellow-edged. Anal orange-violet, with a dark marginal band.

The longest specimen measures  $4\frac{1}{2}$  inches (*Bleek.*).

*Hab.* Rivers of Banten (Java); Celebes?

## 23. SICYDIUM GRISEUM, Day.

*Sicydium griseum*, Day, Journ. Linn. Soc. Zool. xiii. p. 140.

D.  $6\frac{1}{10}$ . A. 11. L. lat. 80. L. trans. ca. 25.

(Teeth in the upper jaw tricuspid?)

Horizontal teeth conspicuous.

The total length of the body (without the caudal) is four and three quarter times the length of the head; the width of the head equals the height. The height of the body is contained rather more than five times in the length. Scales strongly ctenoid, of irregular

sizes and shapes, and in irregular series. The diameter of the eye is one fourth of the length of the head, and about one half the interorbital space. The length of the caudal is less than the length of the head. Dorsal spines filiform, and projecting beyond the membrane. Colours brownish, with eight or nine rings of a darker tint surrounding the body and wider than the ground-colour; fins dark, especially at the edges.

The largest specimen measures 3 inches (*Day*).

*Hab.* South Canara.

#### 24. SICYDIUM PARVIPINNE, Guich.

*Cotylopus parvipinnis*, Guich., in Maillard, Notes sur l'Ile de la Réunion, ii. Add. C, p. 11.

D.  $7\frac{1}{10}$ . A.  $\frac{1}{10}$ .

Horizontal teeth inconspicuous.

The height of the body is contained five and three quarter times in the total length (without the caudal). Belly naked. The diameter of the eye is more than one fifth of the length of the head, and is one half the interorbital space; maxilla does not extend to the vertical from the anterior margin of the eye. The length of the pectoral is equal to the length of the head, and less than that of the caudal, which is one sixth of the total length. The second dorsal is about as high as the body; its rays extend above the membrane, the last being slightly produced into a point. Colour pale yellow, greyish on the belly; each scale with a brown border and a black central spot; dorsal and anal fins yellow, spotted with brown, the latter also with a black marginal band; pectoral yellow, brownish towards the extremity; caudal brownish yellow.

Total length  $4\frac{3}{4}$  inches (*Guich.*).

*Hab.* Bourbon.

#### LENTIPES, Gthr.

*Sicyogaster*, Gill, Proc. Ac. Nat. Sc. Philad. 1860, p. 102 (non Barnw.).

*Lentipes*, Günth. Cat. Fish. iii. p. 96; Bleeker, Arch. Néerl. ix. p. 314; et Versl. Ak. Amst. (2) ix. p. 271; Günth. Fische der Südsee, p. 184; et Challenger Shore Fish. p. 61.

Body subcylindrical, naked, or with the posterior part covered with cycloid scales. Head oblong broad and depressed, with the cleft of the mouth horizontal, or very nearly so. Jaws subequal; snout obtusely rounded; lips not very thick, the lower with a series of numerous, short, pointed, horizontal teeth. A single series of fixed teeth in both jaws; the anterior ones in the upper jaw are closely set and tricuspid, ankylosed to groove on the superior surface of the maxilla, those more remote and those in the lower jaw widely set, simple and conical. Behind the tricuspid teeth in the upper jaw, lie several series of young teeth hidden in the gum, which succeed the former teeth as they become worn out or broken. Eyes of moderate size. Two dorsals, the anterior with six flexible

spines; caudal quite free, ventrals united into a short disk, adherent to the belly. Gill-openings of moderate width; four branchiostegals.

*Hab.* Rivers of the Sandwich Islands.

*Synopsis of Species.*

- I. Body naked, ca. 10 tricuspid teeth on each side of the maxillary suture ..... 1. *L. concolor*.  
 II. Tail covered with small cycloid scales; ca. 16 tricuspid teeth on each side of the maxillary suture ..... 2. *L. seminudus*.

1. LENTIPES CONCOLOR, Gill. (Plate XII. fig. 9.)

*Sicyogaster concolor*, Gill, P. Ac. Nat. Sc. Philad. 1860, p. 102.

*Lentipes concolor*, Günth. Cat. Fish. iii. p. 96; et Fisch. der Südsee, p. 184, et Challenger Shore Fish. p. 61.

D.  $6\frac{1}{10}$ . A.  $\frac{1}{9}$ .

The upper jaw has ten or eleven tricuspid, and about three conical teeth on each side of the maxillary suture. Upper lip with a median notch.

The total length of the body (without the caudal) is rather more than four times the length of the head; the height of the head is two thirds of the width, and the width the same proportion of the length. The height of the body is contained about seven and three quarter times in the length. Scales none. The diameter of the eye is one sixth of the length of the head, and one half the interorbital space. The length of the pectoral is less than, and the length of the caudal equal to, the length of the head. The caudal is contained rather more than five times in the total length. The fifth dorsal spine is slightly produced. Both first and second dorsal fins are rather higher than the body; the latter has its origin considerably in front of the anal. Colour uniform purplish, becoming almost yellowish on the tail. Anal fin with a darker marginal band.

Total length  $3\frac{1}{2}$  inches.

*Hab.* Streams of Hawaii.

One adult specimen.

2. LENTIPES SEMINUDUS, Günth. (Plate XII. fig. 10.)

*Lentipes seminudus*, Günth. Challenger Shore Fish. p. 61.

D.  $6\frac{1}{10}$ . A.  $\frac{1}{9}$ .

The upper jaw has 15-16 tricuspid, and about two conical teeth on each side of the maxillary suture; upper lip with a slight median notch.

The total length of the body (without the caudal) is four and a half times the length of the head; the width of the head is considerably greater than the height, and is two thirds of the length. The height of the body is less than one sixth of the length. The tail is covered with small cycloid scales. The diameter of the eye is one fifth of the length of the head, and more than one half the

interorbital space. The length of the pectoral greater than the length of the head, and equal to the length of the caudal, which is more than one fifth of the total length. Dorsal fins not so high as the body. Colour yellowish, reticulated with brown, fins dusky; a dark spot above the axis of the pectoral.

Total length 2 inches.

*Hab.* Streams of Honolulu.

One adult specimen (type).

#### EXPLANATION OF PLATES.

##### PLATE XI.

- Fig. 1. *Sicydium plumieri*, p. 156.  
2. — *gymnogaster*, p. 158.  
3. — *pugnans*, p. 160.

##### PLATE XII.

- Fig. 1. *Sicydium brevifile*, p. 158.  
2. — *salvini*, p. 159.  
3. — *antillarum*, p. 157.  
4. — *stimpsoni*, p. 166.  
5. Tooth of *Sicydium plumieri*, p. 156.  
6. " *S. gymnogaster*, p. 158.  
7. " *S. pugnans*, p. 160.  
8. " *S. tenuivum*, p. 161.  
9. " *Lentipes concolor*, p. 171.  
10. " *L. seminudus*, p. 171.

#### 2. Note on *Anas capensis*, Gm. By T. SALVADORI, C.M.Z.S.

[Received February 18, 1884.]

(Plate XIII.)

In a large collection of Birds from Shoa, sent to Italy by my friend the late Marquis Orazio Antinori, I found four specimens of a very fine Teal, with which I was not acquainted, so that I really congratulated myself on the idea of describing a most beautiful new species of the Duck-tribe. In this hope I was confirmed by the fact that the species before me was not mentioned in the very recent "List of the certainly known species of Anatidæ," published by Dr. Sclater in 1880 (P. Z. S. 1880, pp. 496-536). But I was soon disappointed when, having carefully looked into the subject, I found that my bird was an old species, first mentioned and described by Latham as "The Cape Wigeon," and afterwards named *Anas capensis* by Gmelin. Although an old species, evidently it is not a commonly known one, as in this case it would not have escaped Dr. Sclater's well-known carefulness. I found also that its history and even its proper name were involved in much confusion, that its geographical distribution was much wider than was supposed, and besides that the bird had never been figured, although Eyton tells us that Smith was intending to give a figure of it in his 'Illustrations of South African Zoology.'

As said above, the first mention of the bird is in Latham's 'Synopsis,' where it is called "The Cape Wigeon." I do not



Harhart imp.

ANAS CAPENSIS.

J. Gould del.



possess the Synopsis, but from what Stephens says, it seems that Latham described it from a drawing of Sir Joseph Banks, soon after which Gmelin named it *Anas capensis*, and gave the following short but satisfactory description of it:—

*"A. cinerascens, dorso spadiceo, alarum speculo ex pallido virescente cæruleo albo marginato; rostrum rubrum, basi nigrum; caput minutim maculatum; pedes rubescentes; ungues nigri."*

*"Habitat ad Caput Bonæ Spei, penelopes magnitudine, 15 pollices longa."*

Between 1790 and 1824 Latham again, as well as Vieillot and Stephens, have mentioned and described this species without adding anything of their own, except that Vieillot said that a specimen of this species was in Sir Joseph Banks's collection, and Stephens, who merely mentions a drawing, attributes the bird to the genus *Mareca*. Specimens of this Duck, brought from the Cape by Delalande to the Museum of Paris, received from Cuvier the name *Anas larvata*, which appeared for the first time in Lesson's 'Traité d'Ornithologie,' but without any description. Eyton, in 1828, gave again a good description of this species, including it in the genus *Querquedula*, and said "it will be figured by Dr. Smith in his forthcoming work on South African Zoology," which, however, never came to pass<sup>1</sup>. Dr. Pucheran, studying the types of the Museum of Paris, described at length "*Anas larvata*, Cuv.," but was not satisfied that it was the same as *Anas capensis*, Gm., and *Anas assimilis*, Forst. According to Schlegel and Hartlaub the present species is *Anas assimilis*, Forst., a surmise which I can scarcely endorse, as Forster's description is not very satisfactory; the question will be settled only by reexamining "*Fig. picta*" quoted by Forster, which, according to G. R. Gray, corresponds to No. 75 of the *Icones ineditæ*<sup>2</sup>. In the meantime I cannot omit noticing that Bonaparte has attributed, with a query, *Anas assimilis*, Forst., to *Anas guttata*, Licht., which bird he calls *Anas sparsa*, Smith, and from what I have been able to gather, I think that Bonaparte is right in his identification. In fact, Dr. Reichenow, to whom I have addressed myself, very kindly informs me that "*Anas guttata*, Licht.," is really identical with *Anas sparsa*, Smith; and as Lichtenstein had already identified *Anas guttata* of Mus. Berol. with *A. assimilis*, Forst., we can admit as most probable that Forster's bird is really identical with *A. sparsa*, Smith, and not with *A. capensis*, Gm., as Schlegel and Hartlaub seem inclined to consider it. In the opinion expressed above I am confirmed by the fact that Lichtenstein, in his 'Nomenclator Avium,' p. 101, includes as separate species *Anas capensis* and *A. guttata*. After these historical and critical remarks I proceed to

<sup>1</sup> Mr. Salvin, in his 'Catalogue of the Strickland Collection,' p. 534, among the references of *Anas capensis*, Gm., includes *Querquedula capensis*, Smith, Ill. Zool. S. Afr. pl. 98; but this is a mistake, as Smith's plate 98 is named *Rhynchaspis* (not *Querquedula*) *capensis*, and does not represent *Anas capensis*, Gm., but a species of the genus *Spatula*.

<sup>2</sup> At the request of Count Salvadori I have referred to plate 75 of Forster's 'Original Drawings' in the British Museum in company with Mr. R. B. Sharpe. We are both of opinion that the figure, although by no means accurate, was based upon a specimen of *Anas capensis*, and not upon one of *A. sparsa*.—P. L. S.]

give the synonymy, description, and the geographical distribution, with what is known of the habits of this species.

**QUERQUEDULA CAPENSIS. (Plate XIII.)**

Cape Wigeon, Lath. Syn. iii. 2, p. 519. n. 64.

*Anas capensis*, Gm., S.N. ii. p. 527. n. 98. (1788) (ex Latham), Latham, Ind. Orn. ii. p. 861. n. 73 (1790); Vieill. Nouv. Dict. v. p. 154 (1816); Id. Enc. Méth. p. 148 (1823); G. R. Gray, Gen. B. iii. p. 616, n. 13 (1845); Licht. Nomencl. Av. p. 101 (1854); Pelz. Novara-Reis., Vög. p. 138 (1865); Chapman's Travels in South Africa, App. p. 422 (1868); G. R. Gray, Hand-list, iii. p. 82, n. 10,640 (1871); Salvin, Cat. Strickl. Coll. B. p. 534, no. 2602 (syn. emend.) (1882).

*Mareca capensis*, Steph. Gen. Zool. xii. 2, p. 139 (1824); Layard, Birds S. Africa, p. 351 (1867); Gurn. in Andersson, B. Damara, p. 339 (1872).

*Anas larvata*, Cuv. MS. Mus. Paris (du Cap, Delalande); Less. Tr. d'Orn. p. 634, n. 72 (1831) (descr. nulla); Pucher. Rev. et Mag. Zool. 1850, p. 549 (descr.); Hartl. Jour. f. Orn. 1855, p. 419.

*Querquedula capensis*, Smith, Cat. S. Afr. Mus. (MS.); Eyt. Mon. Anat. p. 128 (1838); G. R. Gray, Gen. B. iii. p. 616, n. 15 (1845); Boc. Orn. Aug. p. 502 (1881).

?*Anas assimilis*, Forst. (ed. Licht.), Descr. Anim. p. 46 (1844); Schl. Mus. P.-B., Anseres, p. 59 (1866); Gieb. Thes. Orn. i. p. 344 (syn. emend.) (1872); Hartl. Vög. Madag. p. 364 (notes) (1877).

*Querquedula larvata*, Bp. Compt. Rend. xliii. p. 650, n. 99 (syn. emend.) (1856); Boc. Jorn. Ac. Sc. Lisb. 1871, p. 278, 1872, p. 20.

*Capite et collo albidis, nigro punctulatis; gula immaculata; dorso summo fulvo-nigro maculato; uropygio et supracaudalibus albido-rufescentibus, nigro maculatis; pectore summo albedo, nigro fasciolato; gastræo reliquo albedo, obsolete fusco maculato; lateribus et axillaribus fusco maculatis; scapularibus remigibusque primariis griseo-fuscis, illis rufescente marginatis; tectricibus alarum fusco-griseis; speculo alari nitidissimo viridi, nigro circumdato, antice, inferius et postice late albo marginato; rectricibus griseis, albo marginatis; rostro rubro-purpureo ad basin nigro; pedibus ochraceo-fuscis; iride flava. Long. tot. circa millim. 450; altæ 200; caudæ 80; rostri 39; tarsi 38.*

*Hab.* in Africa, ad Caput Bonæ Spei (Latham, Forster, Delalande, Smith, Verreaux, Zelebor, Layard); Namaqua (Andersson); Damara (Andersson); Mossamedes (Anchieta), Rio Coroca (Anchieta); Shoa (Antinori).

As said above, I have had the opportunity of examining four specimens of this Teal, two males and two females, collected in Shoa by the late Marquis Orazio Antinori; the females are not different from males, one of which has been figured in the accompanying drawing (Plate XIII.). Antinori notices the naked parts as follows:—"Iris yellow; bill purplish red, with the base black; feet dark ochraceous." But others describe them a little differently. Layard says:—"Bill red, the base black; legs reddish, the webs dusky, claws black."

According to Andersson the iris is greenish yellow; the upper mandible purplish grey, except a small yellowish-pink patch below the nostrils, which merges gradually into purplish grey; the under mandible pinkish; the legs and toes grey, mixed with brown." Bocage, from Anchieta's notes, says:—"Beo rouge avec un espace noir à la base de la machoire recouvrant les narines et contournant le front de deux côtés; pieds rougeâtres, les palmures d'une teinte plus foncée, et les ongles noirs; iris jaune orangé."

I do not think it possible to confound this Teal with any other species, and indeed I am not able to mention another to which it is nearly allied. The red bill, with the base and nostrils black, the bright green speculum on the wing, and the head profusely streaked with blackish dots, make it very different from any other species known to me. Still it has been confounded by Schlegel and by G. R. Gray with *Anas bernieri* (peculiar to Madagascar), from which it may be easily distinguished by the bill, much larger and less compressed, and not *entirely reddish*, as it is in that species, by the paler colouring of the feathers, by the tail pale grey, instead of darkish brown, by the whiter throat, and by many other different points.

As regards the geographical distribution of this African Teal, for a long time it was only known near the Cape of Good Hope; since it has been found in Namaqua- and Damara-land, and in Mossamedes on the south-western coast of Africa; and quite recently it has been discovered by the late Marquis Orazio Antinori in the kingdom of Shoa, on the north-eastern part of Africa, about the tenth northern parallel. So that we may expect that this bird will be found in all suitable localities between the southern extremity of Africa and Shoa.

The habits of this Teal are like those of the other members of the same genus. Antinori writes that small flights of this Duck live on the very deep lake Haddò; at first he thought that it did not frequent the other lakes of Shoa, but later he killed a specimen in the very shallow lake Cialalakà. According to Antinori this Teal feeds on vegetable substances and aquatic insects. Andersson writes that though this is a rather scarce Duck in Damara- and Great Namaqua-land, he found it more abundant in the immediate neighbourhood of Walvisch Bay than elsewhere in Damara-land. More complete are the accounts we have from the Cape Colony, where Layard says that this Duck is usually confounded with the "Smee Eendte" (*Querquedula erythrorhyncha*), in company with which he has shot it at Beaufort, the Knysna, on the Cape Flats, and at Vogel Vley. At this place he killed one near a nest which contained a single egg; it was probably one of this species, and was of a dirty greenish-white throughout; axis 1" 10", diam. 1" 6". Jules Verreaux told Dr. Pucheran that this species is more common than *Anas erythrorhyncha*, it remains longer near the Cape, and it is very abundant towards the Orange River, and always to be met with in tanks, having the same habits of the allied species. J. Verreaux found small mollusks and insects in their stomachs.

I shall conclude with the remark that this most beautiful Teal has never been brought alive to any of the Zoological Gardens of Europe.

March 18, 1884.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during February 1884:—

The total number of registered additions to the Society's Menagerie during the month of February was 102, of which 13 were by birth, 51 by presentation, 27 by purchase, 3 received in exchange, and 8 received on deposit. The total number of departures during the same period, by death and removals, was 98.

The most noticeable additions during the month were:—

1. A young specimen of the Red-eared Monkey (*Cercopithecus erythrotis*), purchased February 14.

This *Cercopithecus* was originally described by Mr. Waterhouse in our 'Proceedings' for 1838, from an imperfect skin, and was subsequently figured by Fraser in his 'Zoologia Typica' (plate iv.).

The species is new to the collection, and the present individual is the first that I have seen of it. It is said to be from Fernando Po.

2. A fine female example of what appears to be Martin's Monkey (*Cercopithecus martini*), also from Fernando Po, purchased February 19.

This species, a close ally of the Lesser White-nosed Monkey (*Cercopithecus petaurista*), was originally described in our 'Proceedings' by Mr. Waterhouse as long ago as 1838, from two skins (see P. Z. S. 1838, p. 58), and named after Mr. W. L. Martin, author of the well-known volume on 'Man and Monkeys.' I exhibit a coloured drawing of it by Mr. Smit (Plate XIV.). It will be observed that it is at once distinguishable from *C. petaurista* by the black fore limbs and feet, by the absence of any red colour on the tail, by the greenish-grey and not white sides of the face, and by the different form of the white nose. As our specimen is a female, I presume that *C. martini* is also a larger animal. Our specimen of the latter measures, the body about 19 inches, the tail about 24, together 43 inches.

3. An example of a rare Ichneumon from Ceylon, MacCarthy's Ichneumon (*Herpestes maccarthiae*), new to the collection, purchased February 23.

---

Mr. Tegetmeier, F.Z.S., exhibited some specimens illustrative of the variations of colouring in the feet of the Pink-footed Goose (*Anser brachyrhynchus*).

---

Sir Richard Owen, K.C.B., F.R.S., read the twenty-fifth of his series of Memoirs on the extinct birds of the genus *Dinornis* and their allies. The present Memoir contained a description of the sternum of *Dinornis elephantopus*, which had been obtained at Christchurch, New Zealand.

This Memoir will be printed entire in the Society's 'Transactions.'

---

The following papers were read:—

P.Z.S. 1884. Pl. XIV.



J. Smit del.

CERCOPITHECUS MARTINI.

Hanhart imp.

1. On the Diseases of the Carnivorous Mammals in the Society's Gardens. By J. B. SUTTON, Lecturer on Comparative Anatomy, Middlesex Hospital Medical College.

[Received February 26, 1884.]

### *Introduction.*

In this paper it is proposed to give an account, as briefly as is consistent with accuracy and clearness, of some of the more important diseases which affect the Carnivorous Mammals, prisoners in the Society's Gardens.

So far as disease is concerned, there is no need to draw particular distinction between the various groups of this great class of animals. It is sufficient for my purpose to know the kind of food and general habits of any particular animal; consequently, in this paper, the refinements of zoological classification will be set aside, and the word "carnivorous" will be used in the broadest acceptance of that term.

The splendid and varied collection of flesh-eating animals, the property of this Society, offered me a rich hunting-ground for pathological spoil, and rich has been the ingathering.

From the outset of my *post-mortem* experience among these animals, my attention has always been aroused by two very opposite conditions of things:—one is the paucity, and in some cases, the total absence, of lesions to account for death; in the other case, one is struck with the existence of extensive disease of vital organs, which must have been present for a considerable period without destroying life.

For example, a Tiger is reported to be ailing, and in a few days the creature is dead. At the autopsy nothing to account satisfactorily for the animal's death can be discerned even after the most diligent search. Whereas an Esquimaux Dog which had been on the sick list for some time before its death, presented the following list of pathological conditions:—Ulceration of the left fore leg, probably cancerous; old valvular disease of the left side of the heart; atheroma of the aortic arch; three old infarctions in the liver, with three large cysts in the same organ. In addition to these lesions of important viscera, it had an enlarged prostate, an abscess in each testicle, carious teeth (a very rare condition in wild animals), psorosperms by thousands scattered through the voluntary muscles and lungs, and a venous nævus of the skin.

Of course it is within the bounds of probability that, in some of these cases where the animals die with only a few days of previous illness, they have been seized with some acute malady, which up to the present has eluded my search. Another fact of great importance in connexion with this observation should be mentioned. It is the great tendency of animals to die in pairs: for example, a Bear died; three days after its companion was found dead: no obvious lesion beyond evidence of inflammation of the alimentary canal in

one of them. Two Hyænas succumbed in a similar manner. Two Black-faced Kangaroos died within forty-eight hours of each other. Two Foxes were brought to the dissecting room within twenty-four hours; and of this sort of thing many instances among smaller mammals might be given, so as to carry it out of the domain of coincidence.

For some considerable time the suspicion of the existence of some acute specific disease contagious in its nature has held possession of my mind. More than once a singular feeling of languor and uncontrollable depression, accompanied with weariness, has seized me after conducting the necessary dissection on the animals dying after this manner, so that of late I have been more cautious than heretofore.

Let me now pass on to consider the various diseases in detail; they will be treated in the following order:—

1st, Those affecting the skeleton; 2nd, Diseases of the Organs of Respiration; 3rd, Affections of the Circulatory System; 4th, Diseases of the Alimentary Canal and the Viscera appertaining thereto; 5th, the Genito-urinary Organs; 6th, Tuberculosis, which, for various reasons to be explained later on, has been made a separate segment, instead of treating it along with diseases of the respiratory organs.

#### *Diseases affecting the Skeleton.*

1. *Rickets*.—This disease has been encountered many times, but its ravages are most severely seen among the smaller Carnivora. The affection is met with in two very distinct forms—"rickets of infancy" and "late rickets" occurring at puberty.

a. *Rickets of Infancy*.—The chief symptoms are deformity of the long bones and paralysis of the hinder limbs (paraplegia). Death usually results from some intercurrent malady, generally bronchitis, which is a very dangerous complication of rickets, on account of the softened ribs yielding to atmospheric pressure, ending in collapse of the lungs.

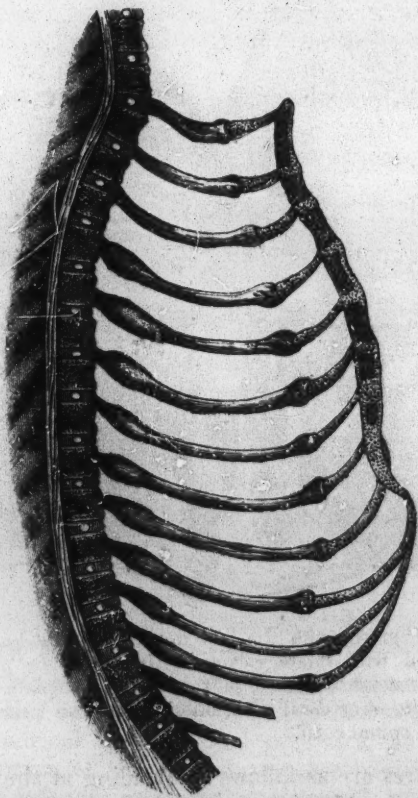
In this form of the disease, the skeleton is affected throughout. The thorax is deformed, there is beading of the ribs at their junction with the costal cartilages, and a second row of beads immediately external to the angles of the ribs: these are caused by partial fracture (infractions) of the softened ribs, and the abundant formation of provisional callus at the seat of injury. This is a very constant feature of the disease in Carnivora, but it may be confined to one side. This double row of rickety beads is shown in the drawing (fig. 1, p. 179). The skull is thin, soft, and in some places absorbed. The teeth are normal in size, number, and development.

The long bones of the limbs are curved, enlarged, and so soft that they may be cut with a knife easily. The periosteum is usually thicker than normal. The line of the epiphysial cartilage to the naked eye presents enlargement, irregularity, and abundance of the curious translucent gelatinous substance known as spongioid tissue, so eminently characteristic of rickets. Submitted to the scrutiny of the microscope, the following changes may be observed:—

(1) A layer of normal hyaline cartilage, which in health should not exceed a millimetre in thickness, but here it may measure as many as six, eight, or even twelve millimetres.

(2) A regular series of columns formed of superimposed cartilage-cells, which in health should consist of ten or twelve cells to the column, each column being separated from its fellow by a spicule of calcareous matter, all arranged as regularly as a phalanx of soldiers. But in rickets as many as fifty cells may be counted in each row,

Fig. 1.



The left half of the thorax of a Binturong (*Arctictis binturong*), severely affected with rickets. It shows the usual beading at the junctions of the ribs and costal cartilages, and a second row of beading just below the angles of the ribs, due to partial fracture and the subsequent formation of provisional callus.

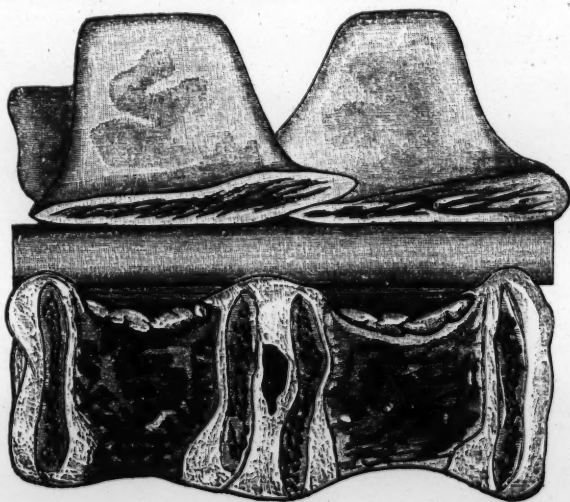
arranged in a disorderly manner, the confusion of disease contrasting remarkably with the definite order observable in the healthy epiphyses.

(3) Beyond these, a layer of irregular calcareous trabeculae enclosing here and there "islets" of spongioid tissue and hyaline cartilage.

This form of the disease is most frequent among the smaller mammals, *e. g.* those of the genera *Canis*, *Cynictis*, *Ichneumon*, &c.

b. *Late Rickets* (Rickets occurring at puberty).—At the age of puberty the disease presents certain peculiar features. In the first place it does not tend to generalize itself as in the form just considered, for it may attack the axial skeleton only, and in some cases affects the skull alone. The deformity is not so marked as in rickets of infancy.

Fig. 2.



A longitudinal section through the last dorsal and first lumbar vertebra of a Lion affected with "late rickets." It shows the proliferation of the tissue in the neighbourhood of the epiphyseal plate, and the abnormal size of the intervertebral disk, bulging into the neural canal and compressing the spinal cord.

Its chief features are as follows :—Beading at the costal junctions is fairly constant. If the epiphyseal cartilages are affected, the spongioid tissue is wanting, and a small quantity of fibrous tissue develops in its place ; the line of the epiphysis is irregular. On this I place considerable importance as a sign of disease.

If the epiphyseal plates of the vertebræ become affected, and this they are very prone to do, the proliferation may give rise to pressure on the spinal cord, and subsequent paraplegia as shown in the drawing (fig. 2), taken from a nearly full-grown Lion affected with this form of the disease.

Hypertrophy of the skull-vault is very common ; it may exceed the usual thickness five or six times, the base of the cranium remaining unaffected. The teeth are large, defective in number, and

late in appearance. Death is usually brought about after this manner. The animal suffers from paralysis of the hind quarters, which gradually ends in paraplegia to such an extent that it is absolutely necessary to kill it. The paraplegia is brought about, as I have explained above, by pressure on the cord due to proliferation of the epiphysal structures, and this is the most important feature of the disease. For the vertebral plates at this age are, of all parts of the skeleton, the seat of the most active growth, just as in infancy the epiphyses of the long bones are undergoing extensive and rapid metamorphosis. The cord, when examined microscopically at the seat of compression, shows an increased quantity of neuroglia, a diminished number of axis-cylinders, fatty granules in abundance, and destruction of the nerve-cells in the grey matter.

2. *Mollities Ossium*.—This singular affection is met with in thoroughly adult carnivorous animals; it is a rare affection. My best and most characteristic case was from the Raccoon-like Dog (*Nyctereutes procynoides*).

The chief features of the disease are these:—Beading of the ribs is wanting; softness of the bones is replaced by hardness and brittleness, so that they break easily; deformity of the long bones may be present to an extreme degree; the alveolar margins of the jaws absorb, allowing the teeth to fall out. When the bones are macerated and dried, they become as light as cork.

Paraplegia is a constant feature of the disease.

Summarizing these three forms of bone-disease arising from constitutional causes, however varied their manifestations, the ætiology is the same, viz. loss of exercise and active life, artificial mode of feeding compared with their wild state of living, and the vicissitudes of an English climate. Indeed, if referring to the human subject, it would be expressed in one terse sentence, "Bad hygienic conditions incident to the life of a captive."

There can be no doubt that the different effects of the disease on the system are due simply to the fact that, at these different epochs of life, physiological processes taking place in a growing bone differ very materially, and as disease is to be regarded as a perversion or exaggeration of normal physiological processes, so we have an example of an alteration of the normal processes which should be in operation during infancy producing "rickets," at puberty "late rickets," and in adult life, when there are no epiphyses for the disease to attack, but "osteoporosis" is in full vigour, perversion leads to "mollities ossium."

There seem to be two rules regarding pathological manifestations.

(a) Acute diseases attack those parts where the blood supply is greatest, and as a consequence growth is rapid.

(b) Functionless organs are prone to undergo degeneration or to become the seat of cancer, &c. Respecting the first rule:—In infancy the long bones are the seat of very active changes, particularly at the epiphyses; hence they become affected with rickets. At puberty, the vertebræ are developing their secondary centres, so they

are prone to become the seat of disease ; hence the so-called predilection of disease to attack particular structures. Examples of rule *b* will be given in treating of diseases of the ovaries.

*Diseases of the Organs of Respiration.*

Diseases of the lungs, in some form or other, make fearful havoc among these creatures, the three most common affections being Bronchitis, Pneumonia, and Pleurisy.

*Bronchitis.*—This condition of lung is most frequent among Lions, Tigers, and Leopards. It is very unsatisfactory to say that a beast died of this affection unless one has seen the creature during life ; but with the bronchi containing much frothy mucus and no other visible lesion, it is always with much reluctance I assent to have this word written in the death column. In rickety animals there is no need for doubt, as with soft, yielding thoracic parietes, even a slight attack of bronchitis in young animals is very quickly fatal.

*Pneumonia (Lobar).*—This is frequently met with among Carnivora ; it runs through the usual stages as observed in man—engorgement, red and grey hepatization. From my observations it would appear that death in the engorgement stage is of more common occurrence than in man. Bears are particularly subject to pneumonia, and in them the inflammatory products, instead of resolving, break down into pus. The posterior lobe of one lung is affected, but the morbid material in its course along the bronchi, and into the trachea, is drawn into the opposite lung by inspiration, so that the portion of lung immediately in the neighbourhood of the larger bronchi of the unaffected lung becomes affected, secondarily, by the morbid material thus inspired.

*Pleurisy.*—Double pleurisy is exceedingly common among the wild Carnivora, as it is in the domestic Cat (I exclude from this list those cases of pleurisy arising from inflammation set up by the presence of parasites in the lungs). The disease is usually double, and of long standing ; the fluid breaks down the barrier between the two pleural cavities, so that they form by means of organized inflammatory material one continuous cavity. The lung-substance becomes condensed and carnified by the pressure of fluid, which often amounts to two gallons ; this interferes with respiration, and the animal dies. This has caused the Society the loss of several very fine animals. The condition of the lung in collapse is so very interesting that it will be well to give a few details respecting it.

*Condensation, Atelectasis, or Apneumotosis* are terms used to signify the condition of the lungs before birth, or in other words lung-tissue which has never contained air. After respiration has been established, if from any cause the lung be rendered airless, as by the pressure of a tumour or particularly of fluid in the pleura, a return to the foetal condition is brought about. A lung which is thus collapsed is often referred to as being in "a state of carnification," on account of the fleshy appearance it presents on section ; this alone is sufficient to distinguish it from pneumonic lung, notwithstanding that it sinks in water.

If sections of a lung, which has been compressed by fluid in the pleura for some considerable time, say six weeks, be examined by the microscope, the following appearances will be noted :—

The pleural covering is very thick, its surface being coated over by a thick layer of organized lymph varying in thickness according to the length of time the disease has existed. From the deeper layers of the pleura there is an invasion of fibrous tissue into the lung-substance, destroying the air-cells immediately subjacent to the original serous covering.

Beneath these disorganized air-cells, a considerable tract of airless tissue exists in which the cell-walls are in apposition, and lie folded together as neatly as a lady's fan. These cells, if inflated during life, would again become functional.

Approaching the main bronchus, curious changes may be seen ; here and there whole tracts of the lung-tissue are in a state of complete disorganization, others are seen with their opposite walls simply in contact, whereas in many parts the air-cells are so dilated that they present all the characters of emphysematous lung, so extreme is the distension of the air-vesicles and so attenuated their walls. Although the lung is apparently in a condition of extreme atelectasis, yet in parts, paradoxical as it may seem, we have to do also with a condition of emphysema and dilated bronchi.

#### *The Organs of Circulation.*

Few and far between are cases of diseases of the heart and blood-vessels in carnivorous animals. Once only have I seen pericarditis, and that was in a Coati. The disease was caused by the extension of inflammation from old-standing double pleurisy.

Valvular disease was seen in an Esquimaux Dog aged at least twelve years. The endocardium was thickened and opaque, the mitral and aortic valves presented vegetations on their free borders, some of which had evidently been detached by the circulating current, as three old infarctions in the liver bore indisputable testimony. Atheroma was encountered twice, once in the aortic arch of a Dog ; the remaining instance occurred in a Coati, in which the whole of the descending aorta was affected, some of the patches being of considerable size.

#### *The Alimentary Canal.*

Affections of the digestive tract are uncommon. Typhoid ulceration of the ilium and colon has been twice noted in the course of my dissections. The symptoms during life were such as to lead one to suspect the nature of the malady, diarrhoea and hæmorrhage from the bowel with similar cases turning up among other animals. The two cases mentioned occurred in a Tiger and a Leopard, about the same time as the cases referred to in my paper on Diseases of Monkeys.

Several Bears have died from enteritis, and in one a perirectal abscess attained to a considerable size, then burst into the peritoneal cavity, giving rise to intense and fatal inflammation. The abscess was in all probability caused by a piece of bone passing through the

wall of the rectum, and, getting into the cellular tissue, acting as a foreign body. I have known a fish-bone accidentally swallowed do the same thing in man.

Dogs are liable to intus-susception of the intestine, caused by swallowing tendons and other similar substances.

#### *Genito-Urinary Organs.*

The following injuries and diseases have been met with :—

Fracture of the os penis in a Coati, which had united with a certain amount of deformity.

Two cases of hæmorrhagic cystitis in Ocelots, without obvious lesions to account for the presence of blood.

Enlarged prostate was found once in a Dog. An abscess of the right ovary in a Coati burst and gave rise to fatal peritonitis.

By far the most interesting case of all was that of a female Tiger aged twelve years, born in confinement.

Fig. 3.

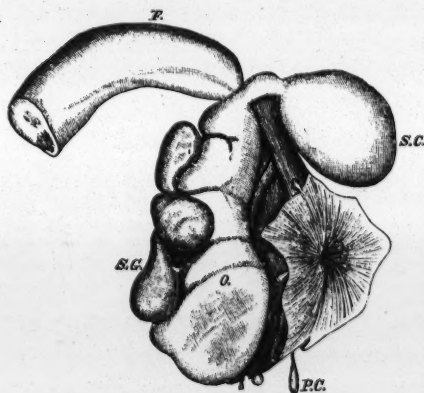


Fig. 4.



Fig. 3. Ovary and Fallopian tube of an old Tiger. O. Ovary transformed into cysts. S.G. Solid growths, which are really hypertrophied corpora lutea. P.C. Pedunculated cysts. S.C. Serous cysts originating in the organ of Rosenmüller.

Fig. 4. Transverse section of the other ovary, showing the cysts in the interior of the organ. S.G. The hypertrophied corpora lutea in transverse section.

The creature succumbed to a smart attack of pneumonia. On examining the ovaries, both presented abnormal conditions. The right ovary contained three solid tumours, about the size of a nut, and of a reddish colour, one of them being pedunculated. Two cysts of the size of a cherry occupied the substance of the organ (see fig. 3).

The left ovary presented three of these reddish solid cysts, two being of firmer consistence than the rest and pedunculated.

A cyst of the size of a gooseberry occupied the substance of the

ovary. Hanging from the fold of peritoneum between the ovary and Fallopian tube (meso-salpinx) is a cyst of the size of a cherry attached by a narrow peduncle, whilst scattered among the fringes of the open end of the Fallopian tube, are numerous pedunculated cysts the size of millet-seeds. These are shown in the annexed drawing (figs. 3, 4, p. 184). The solid cysts, when examined microscopically, proved to be hypertrophied corpora lutea. This case is of extreme interest on account of the relation it bears to similar growths in human subjects. Among the numerous growths originating in the immediate neighbourhood of the ovary in the human female, many of which attain gigantic proportions, two very distinct forms may be readily separated:—

1. Cysts peculiar to the ovary and originating in Graafian follicles.
2. Cysts of the broad ligaments, which, if they attain to any size, may secondarily involve the ovary in the course of their growth.

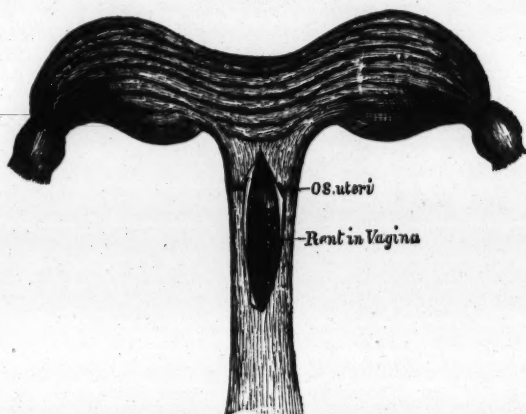
Careful observation has led to the view that cysts starting in the broad ligaments arise in connexion with the "organ of Rosenmüller." This structure and its connecting ducts, lying in the meso-salpinx, is in itself of very great interest, inasmuch as it represents, with the duct of Gaertner, all that remains in the adult female of the Wolffian duct and segmental tubes so largely developed in early embryonic life. In the adult female these must be regarded as functionless organs.

Pathologists have long been aware that functionless structures and remnants of organs are exceedingly liable to take on diseased action; hence it is now the accepted view that the cysts so often found in the broad ligament are to be regarded as abnormal dilations of these pre-existing ducts, remnants of the segmental tubes and ducts of the Wolffian body; therefore it is extremely interesting to find in the ovary of this Tiger the disease in its incipient condition. The interest, however, does not end here, for although I have searched far and wide, this is the first case of its kind which has come to hand. At the outset I mentioned that this particular animal was born in confinement, and must to a certain extent be regarded as a domestic animal. Dogs are occasionally the subject of well-developed ovarian disease; so it is very singular that a disease so prevalent in the human female, met with in the common bitch, and seemingly exceedingly rare in wild animals, should turn up in a Tiger which was born in confinement and passed a long life in the captive state.

A curious case of difficult parturition was seen in a Jackal. One morning I found the creature on the Prosector's table with a distended belly; on cutting into this, two young ones were found loose in the peritoneal cavity, whilst a third was jammed, head downwards, into the pelvis, and there tightly fixed. Examination proved that labour had commenced, but from some cause or other the vagina and neck of the uterus had split on the posterior aspect, and the young had been expelled from the uterus into the peritoneal cavity. The cause of the difficulty may have been the smallness of the pelvic outlet, but I think the *fœtuses* must have been of unusual size. The

rent in the parts is shown in the drawing (fig. 5). It is a well-known fact that when a small bitch tries to accommodate a large Dog, the female often loses her life by rupture of the vagina, and consequent peritonitis. Escaping this, still she may pay the penalty of her lack of prudence, for the young will be unduly large, and delivery by *viæ naturales* an impossibility.

Fig. 5.



The uterus of a Jackal, seen from behind. The rent at the junction of the vagina and cervix uteri was made during parturition, the young escaping into the peritoneal cavity.

#### *Tuberculosis.*

To superficial observation, it would seem that half the animals dying in the Society's Gardens succumb to this affection. It so frequently happens that if the lung presents a spotted appearance, or on section shows caseous spots of any description, the condition is set down as "tuberculosis." After very careful inquiry the conclusion has been forced upon me, that "tubercle" is by no means so common among animals as is generally supposed. In a previous paper, it was shown that Monkeys are rarely attacked by tubercle, and subsequent observations tend to confirm this statement in every particular.

Three diseases are especially liable to be confounded with the one now under consideration. The precision afforded by the microscopical examination of diseased tissues has led to a more rigid definition, and consequent restriction, of the term tubercle from such appearances as the lungs present in lobular pneumonia, or lung-tissue consolidated by pneumonia which, instead of resolving, ends in supuration, and lastly, encysted parasites.

If these three morbid conditions be excluded, then *tuberculosis* is

very uncommon. The larger Carnivora (Lions, Tigers, and Leopards) are exceedingly vulnerable to attacks of pneumonia, and Bears frequently die from this affection, due to the suppuration of the consolidated portion of the lung. The Coati (*Nasua*) is very liable to suffer from cavities in its lungs due to this breaking-down of inflammatory products, and on three occasions pneumothorax has resulted from the rupture of a vomica. Once I met with a Lion with such a condition of things, and, in addition, by some means the air had made its way into the cellular tissue at the root of the neck, so that the creature was "blown up" like a calf in a butcher's shop.

With ordinary care there need be little fear that parasites may be mistaken for tubercle, but this does happen occasionally. By far the most important cases of tuberculosis remain to be described.

For a considerable time I have been investigating tuberculosis in birds, in which the disease is exceedingly common. After a considerable number of observations I came to the conclusion that the disease had its origin in the food or at least in the alimentary canal. From the splendid series of researches which enabled Koch to announce to the world his discovery of the "bacillus of tuberculosis," it would seem that the specific nature of this disease depends on the presence of this minute rod-like organism. On submitting the viscera of the diseased birds to Dr. Heneage Gibbes, who is an authority in this particular department of pathology, he found bacilli by "thousands and tens of thousands."

In December last we communicated these facts to the Pathological Society, and at the same time adduced the following facts as evidence that this disease of Fowls is in all probability infectious. I was aware that certain of the Carnivorous animals, of which the viscera had been examined, presented similar lesions to those observed in the diseased Fowls. Two cases soon came to hand, one a Paradoxure, the other a *Felis eyra*. These animals are fed on birds' heads and viscera, and as their livers contained "bacilli" it was fair to infer that they had accidentally contracted the disease by feeding on tuberculous birds.

What the precise nature and origin of these organisms may eventually turn out to be, is of course very uncertain; the matter is still being investigated and must for the present remain *sub judice*.

The facts recorded in the preceding pages are the outcome of the post-mortem examination of a considerable number of the Carnivora. From January 1882 to February 1884 one hundred and thirty of these animals died, varying in size from a Lion to a *Cynictis*. Of this number I have had the opportunity of examining the viscera of nearly all, excepting now and then, when an animal of great rarity was required for dissection, and its anatomical value far surpassed its interest from a pathological standpoint.

It behoves me in conclusion to offer my very best thanks to the Society for the liberal use of so much valuable pathological material.

2. On a Sea-Lion from the East Coast of Australia (*Otaria cinerea*, Péron). By J. W. CLARK, F.Z.S.

[Received March 18, 1884.]

In the New South Wales Court of the Fisheries Exhibition which was held last year at South Kensington, there were four stuffed Otarias belonging to the Australian Museum, Sydney. They were labelled: "A group of Australian Eared Seals. The Grey Sea-Lion (*Arctocephalus cinereus*, Gr.), from the Seal Rocks near Port Stephens, New South Wales."<sup>1</sup>

The following notes on the four specimens were partly communicated to me by my friend Mr. E. P. Ramsay, Curator of the Museum, partly written by myself.

1. A male from which the skull (figs. 1 and 2) had been extracted. The animal was between six and seven feet long; the hair short, stiff, and bristly, especially on the nape of the neck; the underfur red and very sparse. Colour a uniform brown, rather lighter on the head and on the back of the neck<sup>2</sup>.

2. An animal nearly as large as the former, and said to be a female of the same species. Hair bristly; the general colour brown, but paler on the back than in the male, and on the head and neck inclining to a dusky yellow; on the under surface of the body and on the upper surface of the 'pes' and 'manus' a dark brown. The stuffer had fortunately set the jaws open, so that the teeth could be examined. The molars were  $\frac{6-6}{5-5}$ , each having a posterior and anterior cusp, with the exception of the first tooth in each row.

3. A small *Otaria* rather less than three feet long. It had no skull, and therefore the age could not be ascertained. Hair short and fine, with a dense underfur. Colour a yellowish grey, paler on the under surface of the body, and becoming a light brown on the upper surface of the 'pes' and 'manus.'

4. A very young *Otaria*, about two feet eight inches long, of a uniform dark brown on the back, lighter underneath.

It appears to me that nos. 1 and 2 are rightly referred to the same species, but I doubt about their being male and female; and no. 4 may very likely be a cub of the same species also. It appears to be a rule among the *Otariidae* that the cubs are of a dark brown colour; and Mr. Ramsay informed me that this animal had unquestionably been taken from the same rocks as the former. On the other hand, I suspect that no. 3, from the density of the underfur, is a specimen of the Fur Seal of Australia, for which I ventured to revive the name *Otaria forsteri* (P. Z. S. 1875, pp. 650-677); and which is, I believe, the same as Dr. Hector's *Arctocephalus cinereus* (Trans. New Zealand Inst. 1871, iv. p. 196).

Besides these specimens I purchased a few months since a complete skeleton, not quite full-grown, said to have been obtained from

<sup>1</sup> Port Stephens is an inlet about 100 miles to the north of Sydney.

<sup>2</sup> This specimen is now in the British Museum.

Fig. 1.



*Otaria cinerea*, ♂; side view of skull half natural size; from the old male specimen, No. 1 (p. 188).

the same locality ; and further, Mr. Ramsay was so good as to give me a skin and skull (figs. 3-5) of an animal of about the same age, which had been taken at the same time and place as those exhibited<sup>1</sup>. On the evidence of the skulls, I feel no hesitation in assigning these two specimens to the same species as nos. 1 and 2 of the former group. The skin, however, is much lighter in colour. On the head and back the dark-brown hairs are tipped with yellow, and a good many yellow

Fig. 2.



*Otaria cinerea*, ♂ ; under surface of hinder half of skull to show the form of the opening of the palate and of the auditory bulla ; half natural size ; from the same specimen as fig. 1.

hairs are mixed with the others ; the underside of the body is of a light brown ; and a sparse underfur of the same colour lies at the roots of the hairs on the back. The upper side of the 'pes' and 'manus' is covered with very short fine hair of a rich brown.

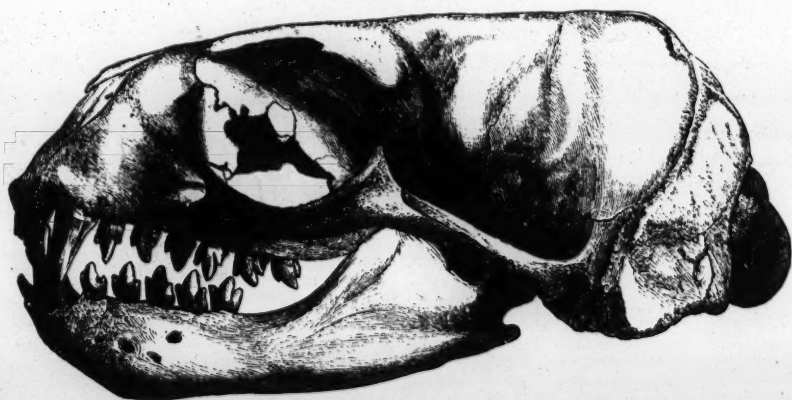
We have, then, before us four specimens of an *Otaria* which has been called *Arctocephalus cinereus* ; and we have to investigate the history of the species, and to determine whether they have been rightly referred to it.

In 1859, Dr. Gray, in one of his numerous revisions of the Seals,

<sup>1</sup> These specimens are in the Museum of the University of Cambridge. The specimen purchased appears to be a male, not full-grown ; that given to me by Mr. Ramsay is a female.

enumerated *Arctocephalus cinereus* among the species which, in his judgment, ought to be referred to the genus *Arctocephalus*, proposed by Frédéric Cuvier in 1824. The species is due to a brief description by Péron, who stayed from December 1802 to February 1803 at an island off the S. coast of Australia, near Adelaide, which the French explorers called Isle Dectès, but which is laid down on modern maps as Kangaroo Island. After describing the numbers of Kangaroos, he proceeds:—"Parmi les Phocacés nombreux qui peuploient les rivages de l'île, on distinguoit surtout une nouvelle espèce du genre Otarie (*Otaria cinerea*, N.) qui parvient à la longueur de 30 à 32 décimètres [9 à 10 pieds]. Le poil de cet animal est très court,

Fig. 3.

*Otaria cinerea*, ♀; side view of skull.

très dur, et très grossier; mais son cuir est épais et fort, et l'huile qu'on prépare avec sa graisse est aussi bonne qu'abondante. Pour l'un et l'autre rapport, la pêche de cet amphibie offriroit de précieux avantages; il en est de même de quelques autres espèces de Phocacés plus petites qu'on trouve également en très-grand nombre sur ces bords, et qui portent des fourrures de bonne qualité."<sup>1</sup>

Péron, as is well known, did not live to write the work on the *Otariidæ* for which he had made preparations, and he brought home no specimens, or, if he did, they have long since disappeared. His brief notice of the *Otaria* which he intended to call *O. cinerea* tells us nothing except that the animal was what is called a "Hair Seal," for he contrasts it with others which possessed abundant underfur.

Ten years afterwards an *Otaria* was captured near Port Western in Bass's Straits, during the voyage of the 'Astrolabe.' MM. Quoy and

<sup>1</sup> Péron, 'Voyage de découvertes aux Terres Australes' (4to, Paris, 1816), ii p. 77.

Gaimard, the naturalists to the Expedition, determined to call it *Otaria cinerea*, out of deference to Péron; and, further, by way of compliment to him, they established the species in his name instead

Fig. 4.



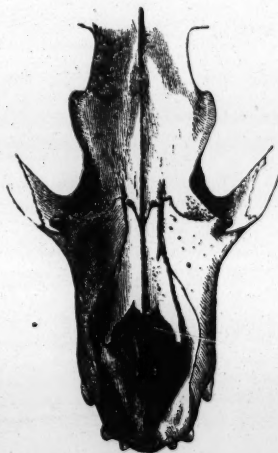
*Otaria cinerea*, ♀; under surface of skull.

of their own:—"Péron a nommé Otarie cendrée une espèce de Phoque prise à peu près dans les mêmes parages que no're individu. Il n'en a point donné de description qui puisse, à proprement parler, la faire reconnaître. Comme cette espèce, la même selon nous que

celle qui nous occupe, a été admise dans les catalogues, nous lui laisserons le nom que lui a imposé le naturaliste que nous venons de citer.”

They then proceed to describe their specimen:—“Tout le pelage en dessus est uniformément grisâtre. Cette couleur devient plus claire sur le museau.—Le menton, les aisselles, les côtés de la partie postérieure et inférieure du corps sont roux. Les côtés du cou sont d'un cendré tirant sur le blanchâtre, et les oreilles sont noirâtres à leur pointe. Les membres postérieurs sont presque noirs, et les antérieurs d'un brun foncé tirant un peu sur le rougeâtre. Les poils de la tête

Fig. 5.



*Otaria cinerea*, ♀; upper surface of anterior half of skull.

et du cou sont longs, rudes, et grossiers; ceux des autres parties sont plus courts et plus serrés. Leur couleur cendrée résulte du mélange de ces poils dont les uns sont d'un blanc jaunâtre et les autres noirâtres. En les écartant on voit un feutre roux peu épais. Les poils qui recouvrent les membres sont très fins et serrés. Les barbes sont fortes et jaunâtres. Les ongles des membres antérieurs sont à peine indiqués. Ceux des postérieurs sont étroits; les trois intermédiaires sont plus saillans, et l'extérieur n'est point apparent.”

I am aware that Mr. Allen<sup>2</sup> has recorded Péron's *Otaria cinerea* among “mythical and undeterminable species;” and had no further description of it been given than the original notice cited above, I

<sup>1</sup> ‘Voyage de découvertes de l’Astrolabe.’ Zoologie par MM. Quoy et Gaimard, i. p. 89, plates 12, 13, 15.

<sup>2</sup> ‘History of North-American Pinnipeds.’ By J. A. Allen. 8vo, Washington, 1880, p. 215.

should have considered that he was right in so doing; but as MM. Quoy and Gaimard thought proper to sink their own individuality in that of Péron, it seems to me that we have no choice left but to accept the species with Péron's name attached to it, more especially as they brought home a skin and skull, both of which are figured in their work, and are now in the Museum of the Jardin des Plantes. These specimens ought, I submit, to be considered as the type of the species; and it was after a careful examination of them that I ventured on a former occasion to mention *Otaria cinerea* as one of the four distinct species of *Otaria* inhabiting the Australian coast (P. Z. S. 1875, p. 676).

I have taken the skulls now before us to Paris and compared them with the type of *Otaria cinerea*, and there can be no doubt that they should all be referred to that species.

The type skull is of an animal not quite adult, stated by the authors to be a male; it is in excellent condition; and the teeth have never been displaced. It is  $10\frac{1}{2}$  inches long by  $6\frac{1}{2}$  inches broad across the zygomatic processes. The form of the nasals and of the orbital process of the frontal will be better understood from the figure of the same bones here given (fig. 3, p. 191) than from any description. Immediately behind these processes the skull contracts suddenly, so that while the width across the processes is  $2\frac{1}{2}$  inches, that across the narrowest portion of the skull behind them, close to the brain-case, is only  $1\frac{1}{2}$  inch. The dental series is, as usual:—

$$i. \frac{6}{4}, c. \frac{1-1}{1-1}, m. \frac{6-6}{5-5} = 36.$$

In the molar teeth the "cingulum" is very feebly developed; and each tooth, both in the upper and lower jaw, has a posterior and an anterior cusp, characters which are very useful in separating this species from that which appears to be most nearly allied to it, *Otaria albicollis*, Péron, = *O. australis*, Quoy and Gaimard, of which there is a fine series in the same museum. The opening of the palate is long and V-shaped (fig. 4, p. 192), and the auditory bulla is prolonged posteriorly into a peg-like process (figs. 2 & 4, pp. 190, 192).

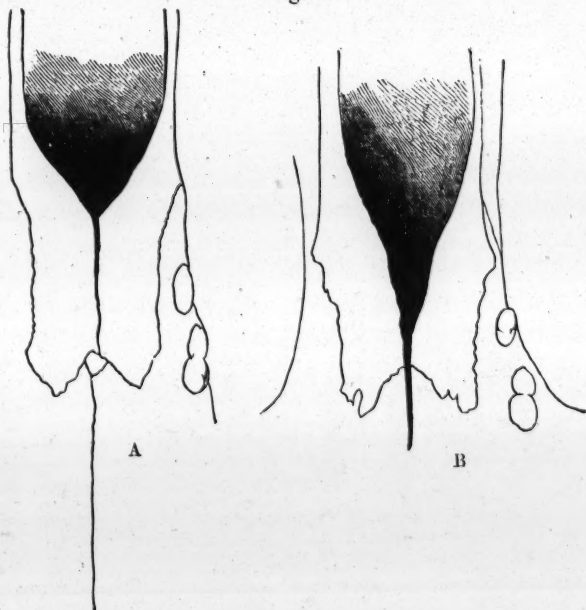
Of the skulls before us, the largest (figs. 1, 2) undoubtedly belongs to a full-grown male. It is  $11\frac{3}{4}$  inches long by  $7\frac{1}{2}$  broad, measured across the zygomatic arches. The occipital and sagittal crests, and the parietal processes, are all fully developed, and the nasals are nearly obliterated by ankylosis with the premaxilla. It is, however, easy to see that the form of these bones, and of the upper part of the skull generally, is identical with the female skull (fig. 5, p. 193), which has been already referred to as closely resembling the type specimen. The palate in the male skull (fig. 2) is more elongated than in either of the others or in the type specimen; but, useful as the form of this part is for specific determination, it must be remembered that it is subject to remarkable individual variations, the neglect of which has led to a needless multiplication of species<sup>1</sup>. In order to show

<sup>1</sup> I hope my friend Professor Turner will forgive me if I quote his *Euotaria schisthyperies* (Journ. Anat. 1868, p. 113) as an instance of this. I feel tolerably sure that the skull so named should be referred to *Otaria pusilla*.

this more clearly, I subjoin figures (fig. 6) of the palates of two skulls of *Otaria ursina*, which I observed in the Royal Museum at Berlin, in August 1875. In the skull marked *A* the opening of the palate is normal, in that marked *B* it is abnormally elongated; but in all other respects the two skulls are perfectly similar.

The skull (figs. 3-5) which I take to be that of a female has been already sufficiently described. It is 9 inches long by  $4\frac{3}{4}$  inches broad. The peculiar form of the teeth, with the strongly developed

Fig. 6.



Palates of *Otaria cinerea*; to show variation in the form of the opening.

A, normal form; B, abnormal form.

anterior and posterior cusps, is well shown in the side view (fig. 3); and again in the view of the under surface of the skull (fig. 4). The third skull is probably of a young male; it is 9 inches long by 5 inches broad. It does not appear necessary to figure it, as it reproduces the characters already remarked in the female on a slightly larger scale.

I must now say a few words on the external characters. The skin of the type specimen is preserved in the Zoological Gallery of the Muséum at the Jardin des Plantes. It is marked "*Otarie cendrée* ♂. *Otaria cinerea*, Péron, *Phoca cinerea*, Fisch. Des côtes de la

Nouvelle Hollande par MM. Quoy et Gaimard." It has been much distorted in stuffing, but indicates a large brown or brownish-grey animal, like the figure in the 'Voyage de l'Astrolabe,' plate 12. The description quoted above, on the other hand, indicates an animal rather grey than brown, like the skin of the female which I have received from Mr. Ramsay. The adult male, however, at the Fisheries Exhibition, and the second specimen there, which I take to be a young male, agree fairly well with the type specimen at Paris and with the figure. I would suggest that the description may have been taken from a female skin, which MM. Quoy and Gaimard believed to belong to a male, while the figure (which appears to have been drawn on the spot, for the authors say that the attitude is that in which the animal lay after death) was really of a male. We know, however, so little about the external appearance of Otariæ, and they look so different according as they are young or old, wet or dry, that we must wait for further material before these points can be cleared up. For the same reason I would for the present return to the original generic name, and refer these specimens to *Otaria cinerea*, Péron.

In 1874 Dr. Gray received a somewhat imperfect skull of an *Otaria* from Dr. Hector, which he referred to this species by comparing it with Quoy and Gaimard's figure, though, as was his wont, he made a new genus for it, and called it *Euotaria cinerea*<sup>1</sup>. This skull is now in the British Museum, along with others received subsequently from Dr. Hector. These skulls are undoubtedly of the same species as that to which, as mentioned above, Dr. Hector has given the name *Arctocephalus cinereus*, or "Fur Seal of Australia." Whether this Fur Seal be identical with the small Fur Seal which I have called *Otaria forsteri*, as mentioned above, is a question which cannot be settled until we obtain a larger series of specimens of different ages and sexes; but I feel certain that it is different from the *Otaria* now before us. The skulls are all broader in proportion to their length; and the molars have not the three prominent cusps which appear to be characteristic of this species.

### 3. On two new Genera of Spiders.

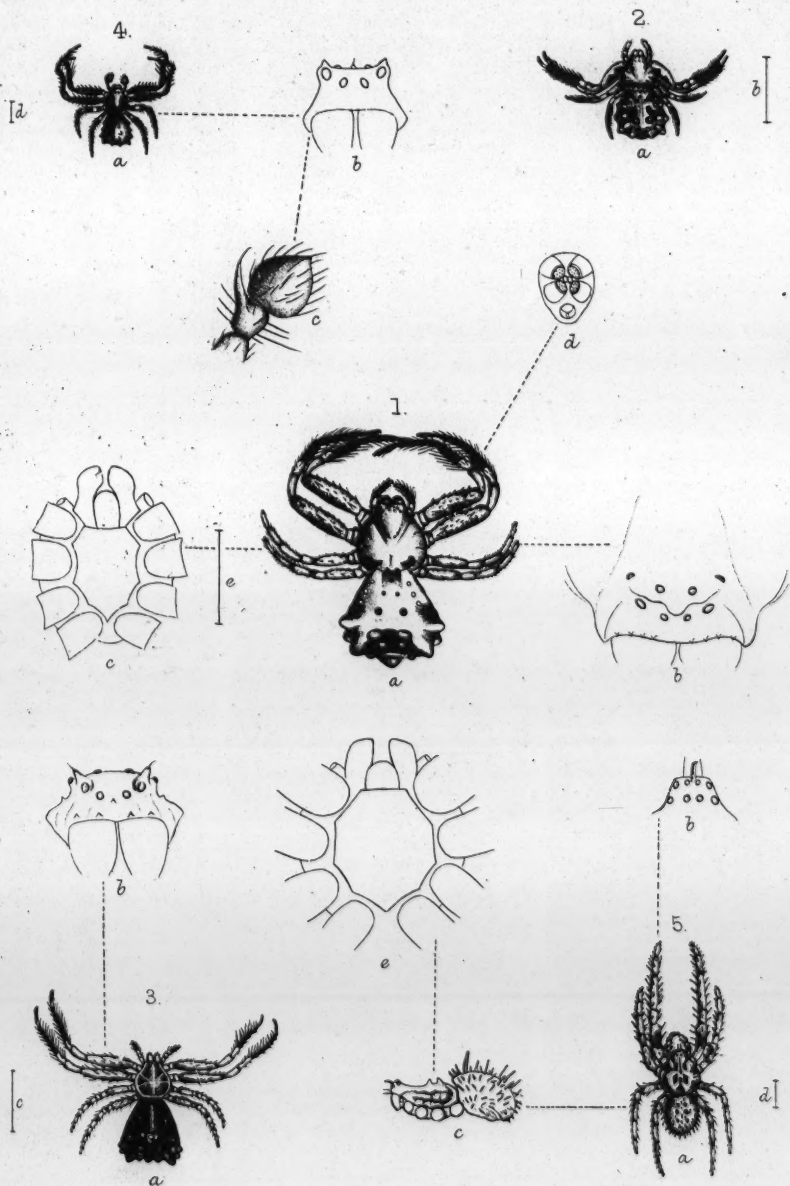
By the Rev. O. P. CAMBRIDGE, M.A., C.M.Z.S., &c.

[Received March 18, 1884.]

(Plate XV.)

Mr. H. O. Forbes has lately described (Proceedings of this Society, 1883, p. 586), under the provisional name of *Thomisus decipiens*, the habits of a Spider which he met with in Sumatra and Java. The Spider itself is remarkable from its exact resemblance to

<sup>1</sup> 'Hand-List of Seals, Mooses, Sea-Lions, and Sea-Bears in the British Museum' (8vo, London, 1874), p. 34.





the droppings of a bird; and is still more remarkable from the increased resemblance effected by its spinning of a thin white web on the surface of a leaf, by means of which it secures itself, on its back, to the leaf, leaving its legs free to enclose and seize any insect unwittingly resting upon, or crossing, the apparently innocuous bird-dropping. Mr. Forbes kindly sent me the Spider for examination before writing an account of its habits. I immediately recognized its near affinity to an East-Indian Spider (*Thomisus tuberosus*, Bl.), of which I possess the type specimen; but, unable at the moment to make a thorough examination and search through books and specimens, I conjectured that it was allied to some Spiders described by Dr. Karsch, and to one sent to me some years ago from South Africa. A more complete examination since made has convinced me that these latter species (referred to by Mr. Forbes) belong to entirely different groups. I find, however, in my collection two other Spiders, from Ceylon and Bombay, of the same genus and very closely allied in species, but quite distinct from that which Mr. Forbes notes. Upon these, together with the one last mentioned and *Thomisus tuberosus*, Bl., I have ventured to found a new genus; and I beg to record my thanks to its discoverer for so kindly sending me an example of *Thomisus decipiens*, and for having also made known to us the very peculiar and interesting habits belonging, not only to that Spider, but also, I have little doubt, to the other three closely allied species here described<sup>1</sup>.

In his description of the habits of *T. decipiens*, Mr. Forbes expresses the difficulty he has in understanding the formation by the Spider of a web which, while serving to attach itself to the leaf, at the same time so exactly represents the fluid portion of a bird's-dropping spread out on the leaf around the more solid parts; and his concluding sentences appear to imply the inference that the Spider consciously supplements the effects of Natural Selection on its form and resemblance to the solid excreta, by spinning a web to resemble the fluid portion. It seems to me, on the contrary, that the whole is easily explained by the operation of Natural Selection, without supposing consciousness in the Spider in any part of the process. The web on the surface of the leaf is evidently, so far as the Spider has any design or consciousness in the matter, spun simply to secure itself in the proper position to await and seize its prey. The silk, which by its fineness, whiteness, and close adhesion to the leaf causes it to resemble the more fluid parts of the excreta, would gradually attain those qualities by Natural Selection, just as the Spider itself would gradually, and probably *pari passu*, become, under the influence of the same law, more and more like the solid portion.

<sup>1</sup> Doleschall ('Tweede Bijdrage tot de Kennis der Arachniden van den Indischen Archipel', p. 58, pl. xi. figs. 9 and 9 a) describes and figures, also from Java, a Spider (*Thomisus dissimilis*, Dol.) possibly of this genus, and perhaps nearly allied to *T. decipiens*; but the description is too meagre and general to enable any certain conclusion to be drawn from it, and the figure given of the eyes is totally unlike.

The other new genus described in the present paper is founded on a very remarkable Spider from Ceylon, belonging to the family *Cryptothelidae*, of which the typical genus is *Cryptothele*, L. Koch (Die Arachn. Austral. p. 239, pl. 20. fig. 2). The new genus *Regillus* may be readily distinguished from *Cryptothele* by several structural differences.

Fam. THOMISIDÆ.

ORNITHOSCATOIDES, gen. nov.

*Cephalothorax* short, broad, as broad or as broader than long, moderately convex above and slightly tuberculose; caput short, truncate in front, and strongly compressed on its lateral margins.

*Eyes* in two curved rows, the anterior shortest (the convexity of the curves directed forwards, and forming a crescent); small, not greatly differing in size, but the fore laterals are largest, and the four centrals smallest; those of the lateral pairs are seated on or at the base of tuberculose eminences.

*Falces* strong, not very long, conical, and nearly vertical.

*Maxillæ* moderately long and strong, a little wider at the top than in the middle; rounded at the top on the outer side, and slightly leaning over the *labium*, which is about half the length of the maxillæ, and of a somewhat oblong form rounded at the apex.

*Sternum* oblong-oval.

*Legs* strong, moderately long, 1, 2, 4, 3; those of the first and second pairs much the strongest and longest but nearly equal in length; those also of the third and fourth pairs are nearly of equal length and strength. The tibiæ are rather strongly bent, and give the legs a peculiar character. All are somewhat roughened or tuberculose, especially those of the first two pairs, and furnished with spines of varied length and strength; those on the tibiæ and metatarsi of the two anterior pairs are strongest, the longest forming two parallel longitudinal rows beneath the joints. The legs terminate with two strong, curved, pectinated claws, beneath which is a small claw-tuft. Among the spines are one or two not very long, rather strong, of a pale colour or semidiaphanous appearance, on the upper sides of the femora; these spines have a peculiar function as observed in one of the species, and may very possibly be of generic value, though spines of various sizes are found similarly situated in many other Thomisid genera, while their special function (if any) has not been yet observed, so far as I am aware, in other instances.

The *palpi* terminate with a single pectinated claw.

*Abdomen* broader behind than in front and truncated at both extremities; the upper surface and hinder part more or less thickly covered with round or subconical, shining, or other tubercular elevations. The spinners are short, stout, and closely grouped within a somewhat circular sheath-like cincture much resembling the disposition of those of many Epeirids.

## ORNITHOSCATOIDES DECIPIENS. (Plate XV. fig. 1.)

*Thomisus decipiens*, Forbes, P. Z. S. 1883, p. 586.Adult female, length rather above  $6\frac{1}{2}$  lines.

The general colour of this Spider is a hoary or yellowish ashy grey marked with black. The abdomen has a large, somewhat quadrate black patch at the middle of its hinder extremity; on this patch are placed eight shining roundish dark-brown tubercles; the four largest form a transverse, unequally sided parallelogram at the fore part of the black patch; the other four, which are much the smallest, form a longer transverse parallelogram immediately behind the other. At the hinder part also, on either side of the shining tubercles, are several strong tuberculiform eminences or prominences, of a similar kind to which are also four small ones in a transverse line at the extreme fore margin; some other depressed spots or pits are also disposed on the upper surface, with a dark blackish suffused patch at the middle of the anterior extremity, and another on each side just in front of the foremost lateral eminence.

The *cephalothorax* has a black irregular patch on each side of the hinder part of the thoracic region. The ocular region is somewhat suffused with blackish, and an irregular black, somewhat V-shaped marking indicates the junction of the caput and thorax. The two anterior pairs of legs have some black suffused markings on the upper side of the femora, the fore half (or rather more) of the tibiæ, metatarsi, and tarsi of those two pairs being almost wholly black; while the two hinder pairs have only an irregular black marking here and there. The spines on the tibiæ and metatarsi of the first and second pairs of legs are numerous, long, strong, and conspicuous.

The pale spines (mentioned above) on the upper sides of the femora are used, according to Mr. Forbes's observations, to secure the Spider on its back to a patch of whitish silk spun upon the surface of a leaf. When so secured the Spider has the exact appearance of the droppings of some bird, and the white silk patch emerging irregularly outside the Spider has the appearance of the more liquid portion of the droppings flowing out and drying on the leaf<sup>1</sup>.

The *eyes* of each row respectively are equidistant from each other, but those of the fore-central pair form a shorter line than those of the hind-central pair. The four central eyes form a square whose anterior side is the shortest; and the height of the clypeus, which projects forwards, is nearly about equal to half that of the facial space.

<sup>1</sup> Mr. Forbes has, since the above was printed, remarked to me that in the two instances which came under his notice, the resemblance extended even to the running down of the fluid excreta towards the lower side of the sloping leaf, ending in a kind of knob. Mr. Forbes also expressly disclaims the idea of crediting the Spider with any conscious design, but he says "that the similitude is so exact that the Spider *might* have had consciousness—i. e. it could not have been more exact if the Spider did have it." Is not its exactness probably the result of the *unconsciousness* of the Spider? Conscious design would possibly have resulted in failure and abandoning the plan, or at best in a more clumsy imitation.

The *legs* are, as described in the generic diagnosis, strong and minutely tuberculose, the *tibiæ* being of a peculiar bent form.

Two examples were found by Mr. Forbes, one in Java, the other in Sumatra.

ORNITHOSCATOIDES TUBEROSA. (Plate XV. fig. 2.)

*Thomisus tuberosus*, Bl. Ann. & Mag. Nat. Hist. ser. 3, vol. xiv. p. 38.

Adult female, length 5 lines.

This Spider, although very similar in general form and appearance to *O. decipiens*, is smaller, and differs in colours and also in the number and disposition of the abdominal tubercles.

The *abdomen* is of a pale olive-brown colour on the upper side; six elongated black markings, three on each side, of different sizes, are continued laterally to the underpart of the abdomen; the hinder pair of these markings meet at the middle of the upper side, where are two shining dark-brown conical tubercles. The rest of the tubercles, which are much more numerous than in *O. decipiens* and vary a little in size, are very similar to the surrounding surface in colour, perhaps a little more of a yellow-brown hue, and all of a conical form; they are somewhat symmetrically disposed towards the sides and at the hinder part of the abdomen. The underside is black, largely patched with cream-colour.

The *cephalothorax* is yellow-brown and slightly tuberculose, and the height of the clypeus rather exceeds half that of the facial space.

The *legs* are cream-colour, marked with yellow-brown, excepting the anterior half of the *tibiæ*, the metatarsi, and anterior portion of the tarsi, which are black-brown. Besides other spines, there are numerous long strong ones on the *tibiæ* and metatarsi of the first and second pairs. There are also the same spines on the upper side of the femora as those whose peculiar function Mr. Forbes has noted in the Sumatran and Javan species. The first two pairs of legs are much longer and stronger than the rest, but they appear to be proportionately shorter than those of *O. decipiens*, as in that species the *tibiæ* are bent, but not to so great an extent.

The *eyes* do not appear to differ much in relative size and position from those of *O. decipiens*.

The *palpi* are yellow-brown, all except the digital joints more or less suffused with cream-colour; they terminate with a single curved pectinated claw.

The *fulcres* are short, strong, subconical, vertical, yellow-brown, with a whitish spot in front towards their base.

The *maxillæ* and *labium* are yellow-brown, and though shorter are of the same form as those of *O. decipiens*.

Mr. Blackwall in his description (evidently by some inadvertence) describes the labium as triangular.

The *sternum* is dark brown, and can scarcely be described as, according to Mr. Blackwall, *heart-shaped*, but of a rather elongate-oval form slightly pointed behind and hollow-truncate before.

The above description (as well as that of Mr. Blackwall) has been made from the type, still in my possession, received many years ago from the East Indies, though from what locality there I do not know.

*ORNITHOSCATOIDES CEYLONICA*, sp. n. (Plate XV. fig. 3.)

Adult female, length 5 lines; in some examples the length is no more than 4 lines.

In general form and appearance this Spider nearly resembles the two preceding species, but it differs not only in colours and markings but also in several other important specific characters.

The *cephalothorax* is slightly tuberculose, of a dull yellowish-brown hue, distinctly and completely margined with cream-yellow, from which some converging lines of the same colour run towards the thoracic junction.

The two central eyes of the posterior row are further apart than each is from the lateral row on its side, and a similar observation applies to the two central eyes of the anterior row. The four central eyes form rather more nearly a square than the corresponding eyes in *O. decipiens*, the anterior side being proportionately rather longer. The height of the clypeus is less than half that of the facial space, and the laterals are not only seated on slight tubercles, but between each of those pairs is a distinct spinous tubercular prominence or short horn, terminating with a short bristle.

The *falces* are short, subconical, vertical, finely tuberculose in front, and of a whitish cream-colour.

The *palpi* are similar in colour to the falces, excepting the digital joint, which is black-brown, blackest at the base.

The *legs* are moderately long, longer but less strong than in the two foregoing species, though possessing the same essential characters and relative proportions. They are of a dull cream-colour, the two fore pairs suffused or mottled above on the femora with pale yellow-brown; the anterior portion of the tibiæ (which are strongly bent), the metatarsi, and anterior part of the tarsi black; at the base, however, of the upper side of the metatarsi is an irregular whitish cream-coloured marking, and the underside of that joint and of the metatarsi also is more or less marked irregularly with a similar colour. The spines on the tibiæ and metatarsi of the first two pairs are very long and strong; the peculiar ones noted as on the upper side of the femora of the two foregoing species are noticeable in the present one also. The two posterior pairs of legs are more of a yellow-brownish hue marked with a paler colour, and also with whitish cream-colour, giving them a somewhat annulose appearance; and there are some strongish spines on the tibiæ and metatarsi. The exinguinal (or basal) joints of the two hinder pairs, and a portion of those of the second pair, have their undersides of a deep rich brown colour.

The *sternum* is of a deep rich black-brown hue, with a large patch of cream-yellow at its fore extremity.

The *labium* is similar in colour to the sternum, with a pale apex, but the *maxillæ* are pale brownish cream-colour, with a brown marking towards their base on the inner side.

The *abdomen* is of a dull yellowish brown (deepening to sooty black in some examples) on the upper side, softening off into cream-yellow on the sides and underneath. Along the middle of the upper side, but not extending to either extremity, is a fine cream-yellow line, and the middle of the hinder part is of a blacker hue than the rest. The tubercles are numerous, symmetrically disposed towards the sides and hinder part, shining, subconical, of various sizes, with a short bristle at the apex of each. The spinners, and the surrounding area to a small and irregular extent, are of a whitish cream-yellow hue. The underside of the abdomen is marked with some considerable patches of black.

Examples of this Spider were received some years ago from Ceylon, from the late Mr. G. H. K. Thwaites.

ORNITHOSCATOÏDES NIGRA, sp. n. (Plate XV. fig. 4)

Adult male, length  $1\frac{1}{2}$  line.

The *cephalothorax* is of a deep rich black-brown hue, tuberculose, and between the eyes of each lateral pair there is (as in *O. ceylonica*) a short horn-like prominence; the tubercular prominences on which those eyes are placed are stronger than in that species; giving a much nearer appearance to the form of the ocular area in *Thomisus*.

The *eyes* are larger than in either of the foregoing species, but preserve the same proportion and relative position as in *O. ceylonica*, and have narrow yellowish rims. The height of the clypeus is less than half that of the facial space.

The *legs* are moderately long and strong, black, tuberculose, armed with long and strong, but not numerous spines on the *tibiæ* and *metatarsi* of the first and second pairs. Some of the tubercles in a longitudinal row on the underside of the femora of those pairs are white; a white annulus encircles the extremity of the *metatarsus* in all the legs; and near the middle of the femora of the third and fourth pairs is a broad annulus of a clear yellow-brown hue, and the tips of the *tarsi* in these legs are also white. The *tibiæ* are bent, as in *O. ceylonica*.

The *palpi* are short; humeral joints black-brown, with a white spot or two near their fore extremity; the cubital joint is somewhat nodiform, brown, with a white spot or two on the inner side; the radial is similar in colour and length to the cubital; its fore extremity is enlarged and has on the outer side an apophysis of a somewhat spine-like character, as long as the joint, tapering to an exceedingly fine, slightly curved, sharp point directed forwards and outwards; the digital joint is of moderate size, ordinary form, and of a deep brown colour. The palpal organs are of a simple form, encircled with a blackish spine. The *falces* are moderate in length and strength, of a deep black-brownish hue.

The *sternum*, *labium*, and *maxillæ* are black, the last slightly tipped with a pale colour.

In this Spider also are the peculiar pale spines above noted on the upper side of the femora.

The *abdomen* is of a uniform black colour; the upper surface and sides towards the hinder part covered with conical tubercles, most of them terminating with a short strong bristle or spine, but some on the sides near the hinder part terminate with a longer, distinct pale spine directed downwards; this deflection, however, may perhaps be only due to accident or some other cause, though I think it is normal.

It is possible that this Spider may only be the male of *O. ceylonica*, though, from the difference in the size of the eyes, as well as from the remarkable differences in colour and markings, I am inclined to think it a distinct species.

A single example was received from Ceylon from Mr. Thwaites, and another from Major (now General) Hobson from Bombay some years ago.

#### Fam. CRYPTOTHELIDÆ.

##### REGILLUS, gen. nov.

*Cephalothorax* large, a little longer than broad, somewhat flattened, deeply indented; thorax round; caput short, and constricted on the margins before.

*Eyes* 8, small, and not differing greatly in size; disposed in two very slightly curved transverse concentric rows, the convexity of the curve directed forwards; the anterior row is shortest; the figure therefore described by the two rows is the frustum of a cone.

*Legs* strong, moderate in length, 1, 2, 4, 3, those of the first pair considerably longest and much the strongest; they are tuberculose and furnished with strong spines, springing from the tubercular prominences; two parallel rows of strong ordinary spines are disposed longitudinally beneath the tibiae and metatarsi of the first and second pairs; others (some semidiaphanous) more prominent, long, obtuse and occasionally clavate at their extremities, are irregularly disposed. The tarsi end with three claws—the two upper claws (each apparently furnished with a single tooth only), and beneath them is a very small one, difficult to be seen.

*Falces* straight, a little retreating, not very long nor strong.

*Maxillæ* short, straight, slightly leaning over the labium, pointed on the inner and rounded on the outer extremity.

*Labium* short, broad, rounded at the apex. These parts were difficult to observe.

*Sternum* short-oval.

*Abdomen* truncate before, broadest and obtuse behind. The whole of the upper surface and sides covered with strong prominent spines of various lengths, some pale and semidiaphanous, others brown and black, some obtuse at the end, others clavate. The whole Spider is thus of a very hirsute and bristling appearance. The spinners are short, closely grouped together, and almost entirely concealed by a marginal series of long coarse hairs which converge over them; I

could, however, discern four, and I feel little doubt but that within these are the normal third minute pair.

This genus is allied to *Cryptothele*, L. Koch, but differs essentially in the position of the eyes and form of the maxillae. It resembles *Cryptothele* in the concealment of the spinners. Dr. L. Koch says these are two in number. In the only example I have of *Cryptothele* I cannot discern any at all; while, as above noted, I perceive at least four in the present genus. It seems therefore possible that *Cryptothele* may have the normal number of six, or at any rate more than the two noted by Dr. L. Koch.

REGILLUS ASPER, sp. nov. (Plate XV. fig. 5.)

Female (not quite adult), length  $1\frac{3}{4}$  line.

The whole Spider is of a yellow-brown hue, the legs palest. The cephalothorax, looked at in profile, has a strong dip or hollow curve between the ocular area and the thorax, and the normal indentations are strong; about the middle of the thorax, which is rather raised, are two strongish tubercular prominences in a longitudinal line; these probably were once surmounted by spines, though now broken off. A strong, curved, obtuse double spine issues forward, from near the middle of the ocular area, and there are two others below it, in a transverse line, longer but less strong. There are other spines on the clypeus (the height of which is less than half that of the facial space), and on other parts of the cephalothorax, but those specially noted are the most conspicuous. The surface of the cephalothorax is covered with short coarsish pubescence, and is marked by some darker brown markings roughly arranged in longitudinal rows.

The eyes are seated on separate tubercles; those of the anterior row are divided by as nearly as possible equal intervals of rather more than an eye's diameter, while the hind centrals are nearer together than each is to the hind-lateral eye on its side.

The legs are pale yellow-brown, somewhat pubescent like the cephalothorax, armed as above noted in the generic diagnosis, and the femora are marked (chiefly on their undersides) with some distinct but broken dark-brown annuli.

The palpi are pale yellow-brown, short; the digital joint somewhat tumid and ending with a simple (unpectinated), curved, spine-like claw.

The abdomen projects a little over the base of the cephalothorax; it is yellow-brown, marked along the middle of the upper side with some slightly darker roundish impressed normal spots in transverse pairs, and with an apical one at the middle of the fore extremity, thus forming two lines diverging from the middle of the fore margin backwards. Its spinous armature has been noted above in the generic description.

A single example was received many years ago, from Ceylon, from Mr. G. H. K. Thwaites.

## EXPLANATION OF PLATE XV.

1. *Ornithoscatoides decipiens*, sp. n., ♀, p. 199.  
a, Full figure of Spider, magnified; b, caput and eyes, from in front; c, underside of cephalothorax, showing maxillæ, labium, and sternum; d, spinners; e, natural length of Spider.
2. *Ornithoscatoides tuberosa*, Bl., ♀, p. 200.  
a, Spider, slightly magnified; b, natural length.
3. *Ornithoscatoides ceylonica*, sp. n., ♀, p. 201.  
a, Spider, magnified; b, caput and eyes, from in front; c, natural length of Spider.
4. *Ornithoscatoides nigra*, sp. n., ♂, p. 202.  
a, Spider, magnified; b, caput and eyes, from in front; c, left palpus, from above; d, natural length of Spider.
5. *Regillus asper*, sp. n., ♀, p. 204.  
a, Spider, magnified; b, eyes, from above and behind; c, Spider in profile, without legs or palpi; d, natural length of Spider; e, underside, showing maxillæ, labium, and sternum.

---

April 1st, 1884.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

This being the first occasion of a meeting of the Society in the house No. 3 Hanover Square, to which it had lately removed, the President took the opportunity of congratulating the Fellows present on the very great improvement in the meeting-room, the library, and the offices effected by the change. The Society had occupied the old house No. 11 Hanover Square for forty-one years, and had long since quite outgrown the accommodation afforded by it in all the three departments just mentioned.

The income of the Society had increased from £9137 in 1843 to £28,966 in 1883, with a corresponding increase of clerical work. The Library had been almost entirely formed since the former date, and was rapidly increasing, and the attendance of Fellows at the evening meetings had been such that the old rooms were quite inadequate for the purpose. The President trusted that the increased facilities now afforded would be taken advantage of by the Fellows in promoting, with even greater zeal than hitherto, the work for which the Society was founded, and in maintaining and extending the high reputation it had acquired in the scientific world.

The President also referred to the ceremony in which many of the Fellows had taken part that day, of the re-interment at West Wickham of the remains of the late Prosector, Mr. W. A. Forbes, whose life had been so prematurely cut off while engaged in a zoological exploration of the River Niger; and spoke of him as one deserving of all the honour the Society could show, not only on account of his official connexion with it, but also for the personal regard in which he was held by all who knew him, and for the distinguished position he had already acquired as an original investigator in Zoological Science.

---

Professor Flower exhibited four skulls of the Common Bottle-nose Whale (*Hyperoodon rostratus*) of the Northern Seas, exhibiting the progressive development with age of the maxillary crests in the male sex, as described in the Proceedings of the Society for 1883, p. 722. They were all from animals caught by Captain David Gray, and presented by him to the Museum of the Royal College of Surgeons.

No. 1. Skull of a male fœtus (No. 2897, Cat. Osteology, Mus. Roy. Coll. Surg. pt. ii. 1884), taken from the uterus of its mother, caught in May 1883 in 68° 43' N. lat., 11° W. long. The animal measured 10 feet 11 inches in length. The cranium was 67 cm. long from the occipital condyles to the apex of the rostrum, and the maxillary crests were so little developed as to rise only 6 cm. above the level of the contiguous premaxillary bones.

No. 2. Skull of a young male (No. 2896). From an animal 16 feet in length, taken by the side of its mother, and which had only milk in its stomach. The cranium was 71 cm. in length, with maxillary crests 16·5 cm. high.

No. 3. Skull of an older male (No. 2895), supposed by Captain Gray to be about one year old. It was 19 feet 6 inches in length, and had been caught July 9, 1883, in 71° 19' N. lat., 6° 5' W. long. The cranium was 134 cm. in length, and the crests 24 cm. high.

No. 4. Skull of an adult male (No. 2894). From an animal taken in the North Atlantic, between Iceland and Jan Mayen Island, in the summer of 1881. The cranium was 180 cm. in length, and the maxillary crests 46 cm. high, rising considerably above the occipital crest, and so thick as to approach very closely to each other in the middle line. This was the form described by Gray under the name of *Hyperoodon latifrons*, and afterwards *Lagenocetus latifrons*; but the type specimen, now in the British Museum, was from a still older animal, the crests being both higher and more massive.

Professor Flower also exhibited a mass of pure spermaceti obtained by Messrs. Langton and Bicknell from the "head-matter" of Hyperoodons killed by Captain Gray, thus corroborating the observation of Chemnitz quoted in the paper referred to above.

---

Mr. Slater exhibited specimens of the eggs of two species of Testudinata recently laid by animals living in the Society's Gardens, viz. *Testudo elephantopus* and *Chelys matamata*. Both were pure white and nearly circular in form, the former measuring 1·8 inch and the latter 1·5 inch in diameter.

---

Mr. R. Bowdler Sharpe exhibited and made remarks on a Red-throated Pipit (*Anthus cervinus*), caught near Brighton in March last and now in the collection of Mr. T. J. Monk, at Lewes. Mr. Sharpe exhibited at the same time an example of the true Water-Pipit (*Anthus spinoletta*), captured at Lancing, in Sussex, in March 1877, from the collection of Mr. F. Nicholson.

---

Prof. E. Ray Lankester, F.R.S., exhibited and made remarks on a living example of a Scorpion from Ceylon (*Buthus cœruleus*).

A communication was read from Prof. T. Jeffrey Parker, being the first of a series of studies in New-Zealand Ichthyology. The present paper gave a description of the skeleton of *Regalecus argenteus*. The species was founded on a specimen cast ashore at Moeraki, Otago, in June 1883.

This paper will be printed entire in the Society's 'Transactions.'

The following papers were read :—

1. On the Acclimatization of the Japanese Deer at Powerscourt. By Viscount POWERSCOURT, F.Z.S.<sup>1</sup>

[Received February 28, 1884.]

In the years 1858 and 1859 I took up the idea of experimenting upon the acclimatization of various animals which I thought might be ornamental as well as useful in Deer-parks in the United Kingdom, as suggested by the collection formed at Knowsley by Lord Derby.

I purchased, mostly from Jamrach, the well-known animal-dealer, various kinds of Deer and Antelopes.

I had at one time alive together in a park formed for the purpose at Powerscourt, in a part of the place called the Racecourse, containing about 100 acres, of which about two thirds was open pasture and one third wood, Red Deer, white as well as common, Sambar Deer, Nylghaies, Axis Deer, Llamas, Elands, Wapiti Deer, and Moufflons or Wild Sheep.

The Red Deer of course increased, and the Wapiti Deer also bred ; but the Nylghaies, which were running about quite healthy one evening, were both found dead the next day.

The Sambar Deer lived for two or three years, but never thrived well, neither did the Axis Deer. The Elands were also too delicate for the climate of Ireland, and I very soon found it necessary to dispose of them, as they would not have lived. I had only a pair of them, and they were sold to the Antwerp Zoological Gardens.

There were originally three Wapiti Deer, unfortunately only one of them a female, and they were of the same breed which Lord Derby had had at Knowsley. I tried to get another female, but at that time it seemed to be almost impossible ; the female which I had, met with an accident and broke her leg, but nevertheless she produced a stag calf a few months afterwards. She had had a female calf the year before, so that my herd was increased to five animals. But the only males were the sire of the female calf and another young male, which died. I then, finding the small park where they were too confined in space, had all the Deer caught and removed to the large Deer-park, containing about 1000 acres.

<sup>1</sup> See, for previous notes on this subject, P. Z. S. 1879, p. 294.

After all the Deer had been there for a year there was a remarkable improvement in their health, from the extent and variety of pasture which they had there, and the Wapiti as well as the Sambur and Red Deer improved very much. But unfortunately one of the Red Stags had a fight one day with the Wapiti, and, being more active, gave him a thrust and broke his hind leg, just below the hock. We managed to secure the wounded Wapiti and to set the leg; but although the bone knit, and he could put his foot to the ground, he never recovered, but dwindled away and died. I then sold the remainder of the Wapiti to an agent of King Victor Emmanuel of Italy.

The Sambur Deer lived for three or four years, and as there was no male (one which I had got from the Royal Collection at Windsor having died), there were several hybrids born, no doubt between a Red Stag and the Sambur hinds, but one by one, both the pure Sambur and the hybrids died off, until there were none left. The climate was evidently too damp for them.

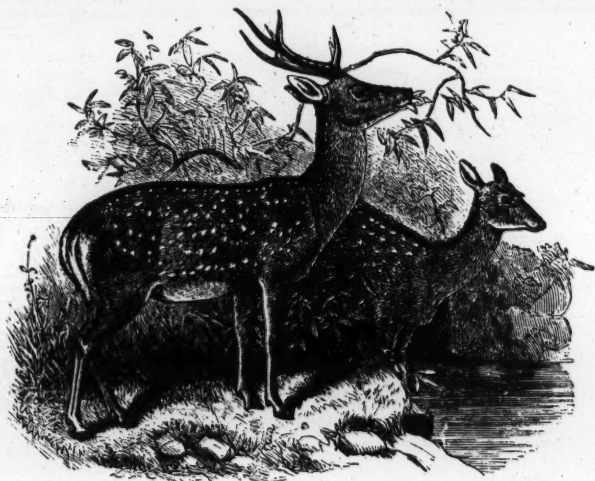
It was a curious thing with the Sambur Deer, and it was no doubt the cause of their death, that they never would come out of the thickets in the daytime. They unfortunately could not be taught that Ireland has not a tropical climate, and they used to skulk in the thickest cover they could find, *out of the sun*, all day, and only came out to feed at night, as they would in the jungles of Mysore, where I have seen them pursuing the same tactics. Of course by this unnecessary precaution on their part against the meridian rays, of which we should like to see a little more in this country than we do, they got chilled through, and eventually died.

In the meantime, on a visit to Jamrach I had seen some Japanese Deer (*Cervus sika*); and I thought that as the climate of Japan is a pretty severe one in winter, I would try if they would succeed any better than the other species. I bought therefore one male and three females; and these have been the only Deer of any newly introduced kind which have been a real success.

The Llamas and other animals all died off; and these pretty little Deer are the only ones which have multiplied, and have also never required any shelter of any kind nor any winter-feeding except what the ordinary Red Deer and Fallow Deer get, such as hay &c. I find that Indian corn is the best food for all Deer after hay. It is easily given, and there is no waste, as they pick up every grain as soon as thrown out to them. I tried locust beans, which are good but expensive, and also oil-cake, but they do not eat that up so clean as the Indian corn, and if the weather is wet it melts away.

There should be rock-salt always given to Deer, in places where it can be put, in a shed of some kind, so as not to be exposed to wet.

These Japanese Deer were put into the park at Powerscourt about the year 1860, and at present (1884) I have upwards of 100 of them, besides having shot two or three yearly, and also having given away a great many and sold others.



The Japanese Deer (*Cervus sika*).

I have distributed Japanese Deer from my herd to the following places up to this time, and I believe they are thriving in every locality where they have been introduced; so that they may be looked upon quite as a British Park-Deer:—at Killarney, in the woods of Muckcross; at Glenstal (Sir Croker Barrington's), near Limerick; at Castlewellan (Lord Annesley's) in county Down; at Colebrooke (Sir Victor Brooke's), county Fermanagh; at Lord Ilchester's, Melbury, Dorsetshire; and at Baron Ferdinand de Rothschild's, Waddesdon Manor, Aylesbury.

The Japanese Deer here have undoubtedly interbred with the Red Deer; there are three or four Deer in the Park here which are certainly hybrids, the Red hind in each case being the dam.

The Japanese are a most satisfactory little Deer; the venison when dressed is about the size of Welsh mutton and very well flavoured. The little Stags, with their black coats and thick necks like miniature Sambur, are very picturesque and ornamental, and I think they are a decided addition to our varieties of hardy Park Deer. Some of them are always to be seen in the Society's Gardens; but these give no idea of the beauty of the animals when in a wild state in a park.

They also have a most peculiar cry in the rutting-season, a sort of whistle, varying sometimes into a scream.

Any body wishing for venison of a small size and good quality will, I think, find these Deer very desirable for that purpose.

2. Diagnoses of new Reptiles and Batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M.B., H.M.S. 'Lark.'  
By G. A. BOULENGER, F.Z.S.

[Received March 25, 1884.]

*LEPIDODACTYLUS GUPPYI*, sp. n.

Head small, oviform; body elongate; limbs moderate. Digits moderate, inner well developed, webbed at the base; eleven lamellæ under the median digits, the two or three proximal divided. Scales uniformly granular, the granules larger on the snout, largest and flat on the belly. Rostral quadrangular, more than twice as broad as high; nostril pierced between the rostral, the first upper labial, and three nasals; eleven or twelve upper and as many lower labials; mental small, smaller than the adjacent labials; three or four rows of very small chin-shields. Tail cylindrical, tapering, covered with small equal flat scales. Pinkish brown above, sides with darker spots; a dark streak on the side of the head, passing through the eye; tail with dark annuli; lower surfaces whitish, throat speckled with reddish brown.

From snout to vent 48 millim.; head 12 millim.; tail 45 millim.  
Faro Island.

*HOPLOCEPHALUS PAR*, sp. n.

Scales in 16 rows (14 posteriorly). Head moderately large, depressed; superciliaries not projecting; vertical shield a little longer than broad; two postoculars; seven upper labials, third and fourth entering the eye; temporals 1+2+3; the chin-shields of the posterior pair separated from each other by a scale. Ventrals 166; anal divided; subcaudals 43. Upper surface of body with broad reddish-brown cross bands separated by narrow interspaces; upper surface of head, and edges of the scales blackish brown; lower surfaces and interspaces between the red bars white.

Total length 75 centim.; tail 11 centim.  
Faro Island.

*RANA BUFONIFORMIS*, sp. n.

Near *Rana kuhlii*.

Vomerine teeth in two oblique series behind the choanæ. Habit stout, toad-like. Head very large, with short broad snout; canthus rostralis distinct; interorbital space as broad as the upper eyelid; tympanum distinct, one third the diameter of the eye. Fingers short, with slightly swollen tips, first extending beyond second; toes two thirds webbed, the tips dilated into regular disks; subarticular tubercles large; two metatarsal tubercles, inner oval, blunt, outer rather indistinct. The hind limb being carried forwards along the

body, the tibio-tarsal articulation reaches the hinder border of the eye. Upper surfaces entirely covered with porous warts, forming a small paratoid-like ridge above the temple; belly and lower surface of thighs feebly granulate. Uniform purplish brown above, yellowish inferiorly.

From snout to vent 145 millim.

Treasury Island.

*RANA GUPPYI*, sp. n.

Near *Rana grunniens*.

Vomerine teeth in two short straight transverse series behind the choanæ. Head large, subtriangular; canthus rostralis distinct; interorbital space as broad as the upper eyelid; tympanum distinct, two fifths the diameter of the eye. Fingers moderate, with slightly dilated tips, first extending beyond second; toes nearly entirely webbed, the tips dilated into small disks; subarticular tubercles large; two metatarsal tubercles, inner elliptic, blunt, outer rather indistinct. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the tip of the snout. Upper surfaces minutely warty; a strong fold above the tympanum. Dark olive above, dirty white inferiorly.

From snout to vent 165 millim.

Shortland Islands.

*RANA OPISTHODON*, sp. n.

Near *Rana grunniens*.

Vomerine teeth in two transverse oblique series between and behind the choanæ. Head large; snout rounded, with distinct canthus rostralis; interorbital space as broad as or a little narrower than the upper eyelid; tympanum distinct, two fifths to half the diameter of the eye. Fingers moderate, with slightly dilated tips, first extending beyond second; toes three fourths webbed, the tips dilated into small disks; subarticular tubercles large; inner metatarsal tubercle elliptic, blunt; no outer tubercle. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the eye. Upper surfaces nearly smooth or with rather large warts, which are rounded on the upper eyelids, pelvic region, and limbs, elongate on the back; a strong fold above the tympanum. Dark brown above, with more or less indistinct darker markings; hinder side of thighs light-dotted; lower surfaces whitish.

From snout to vent 125 millim.

Faro Island and Treasury Island.

*CORNUFER GUPPYI*, sp. n.

Vomerine teeth in two short transverse series behind the level of the choanæ. Habit of *Rhacophorus maculatus*. Head large, much depressed, with well-marked canthus rostralis; interorbital space as broad as the upper eyelid; tympanum three fifths the diameter of the eye. First finger shorter than second; disks of fingers very

large, as large as the tympanum; toes one third webbed, the tips dilated into large disks, which are, however, not quite so large as those of the fingers; two rather indistinct metatarsal tubercles. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the anterior corner of the eye. Skin smooth, granular on the belly and under the thighs; a fold from the eye to the shoulder. Light brown or pinkish above, spotted or dotted with brown; legs cross-barred; lower surfaces whitish.

From snout to vent 68 millim.

Treasury Island.

*CORNUFER SOLOMONIS*, sp. n.

Vomerine teeth in two transverse or slightly oblique, slightly arched series behind the choanæ. Head very large; snout rounded, as long as, or slightly longer than, the orbital diameter; eyes extremely large; interorbital space narrower than the upper eyelid; tympanum round, nearly half the diameter of the orbit. Fingers moderate, first extending beyond second; toes moderate, with a slight rudiment of web; tips of fingers and toes swollen rather than dilated; subarticular tubercles very strong; two metatarsal tubercles. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the eye. Upper surfaces slightly granulated, with short longitudinal folds; a strong fold from the eye to the shoulder. Grey-brown above, with more or less distinct darker markings; loreal and temporal regions dark brown; lips with more or less marked dark vertical bars; tympanum chestnut-brown.

From snout to vent 75 millim.

Shortland, Treasury, and Faro Islands.

*CERATOBATRACHUS*, g. n.

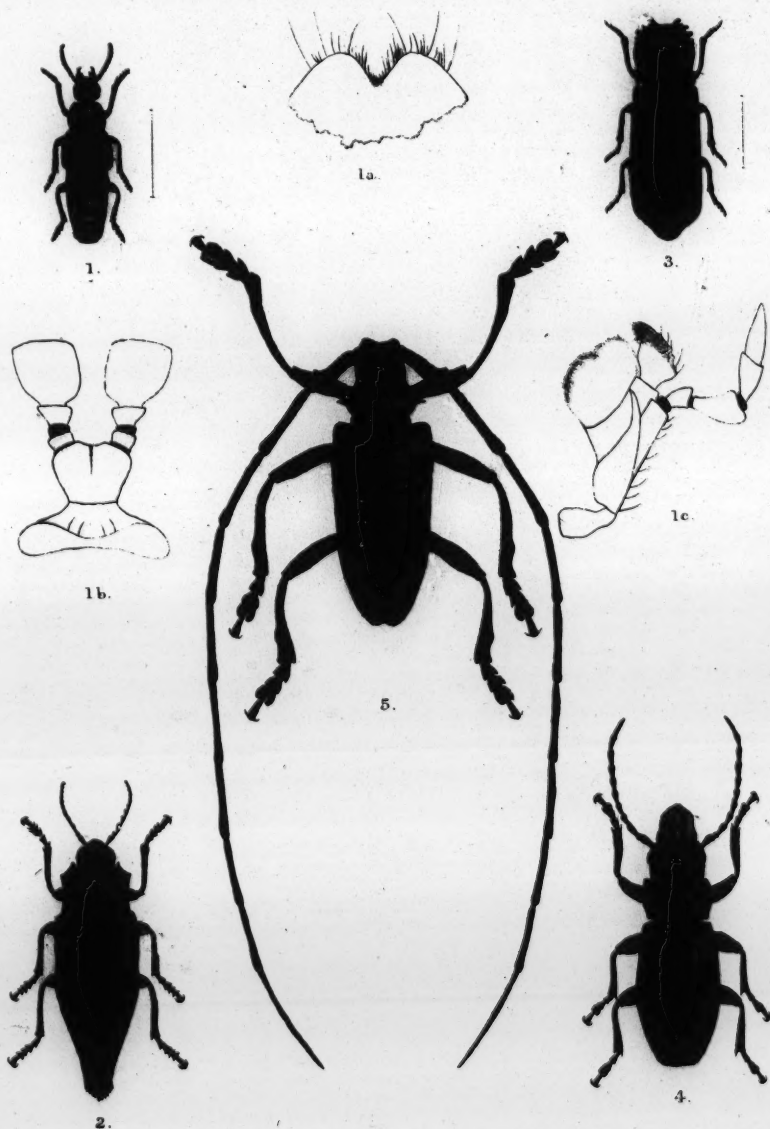
The type of a new family, *Ceratobatrachidæ*, occupying in the series Firmisternia the place which the *Hemiphractidæ* occupy in the Arcifera, and characterized by the presence of teeth in both upper and lower jaw, and by the diapophyses of the sacral vertebra not being dilated.

Pupil horizontal. Tongue deeply notched and cordiform, extensively free behind. Vomerine teeth. Head large, strongly ossified. Tympanum distinct. Fingers and toes free, with non-dilated tips. Outer metatarsals united. Precoracoids present; omosternum and sternum with a bony style. Terminal phalanges simple.

*CERATOBATRACHUS GUENTHERI*, sp. n.

Vomerine teeth in two small groups behind the level of the choanæ; latter large, eustachian tubes larger still. Head triangular, not much smaller than the body; mouth enormous; interorbital space broad, concave; tympanum large, vertically elliptic; skull with prominent ridges and a small curved spine at the angle of the jaws. Hind limb rather short. Digits swollen at the tips, with strong subarticular tubercles. Upper surfaces with linear ridges





M. Hermann-Fischer del et lith.

COLEOPTERA FROM TIMOR-LAUT.

Mintern Bros. imp.

variously arranged; belly granulate; a triangular, papillose, dermal flap on the tip of the snout, on the edge of the upper eyelid, above the vent, and on the heel. Colour and markings very variable. Male with two internal vocal sacs.

From snout to vent 85 millim.

Treasury, Shortland, and Faro Islands.

3. On the Coleopterous Insects collected by Mr. H. O. Forbes in the Timor-Laut Islands. By CHAS. O. WATERHOUSE.

[Received March 27, 1884.]

(Plate XVI.)

The number of species of Coleoptera collected by Mr. Forbes in the Timor-Laut Islands is twenty-nine. Of these the following deserve special notice on account of their geographical distribution:—

1st. *Diaphætes rugosus*, a new genus and species of Staphylinidæ, which Mr. David Sharp informs me he possesses from Java.

2nd. *Cyphogastra angulicollis* (from Larat), a species of Buprestidæ, only previously known from Banda.

3rd. *Cyphogastra splendens* (from Maroe), a new species closely allied to the preceding.

4th. *Archetypus rugosus*, n. sp. This genus of Longicorns, of which there was only one species previously known, occurs in Waigiu, Dorey, and Aru.

5th. *Pelargoderus rugosus*. Another new Longicorn closely allied to *P. arouensis*.

6th. *Nemophas forbesii*. A third new Longicorn nearly allied to *N. grayi* from Amboyna.

CARABIDÆ.

CATASCOPUS AMGENUS, Chaud.

Two specimens which may perhaps be merely varieties of this species. They are, however, darker in colour than any in the British-Museum collection, being of an obscure olive-æneous, shading into dark purple at the sides of the elytra.

*Hab.* Maroe.

STAPHYLINIDÆ.

DIAPHÆTES, n. gen.

General characters of *Staphylinus*, but with the head smaller than is usual in that genus. Labial palpi robust, with three visible joints; the first and second short, the apical one very large and cup-shaped. The maxillæ are very broad, the inner lobe a little longer

than broad and densely covered with hair; the outer lobe produced a little beyond the inner one, the apex with dense matted hair, with four or five stiff bristles on the outer side. Basal joint of the maxillary palpi short; the second and third stout, about twice as long as broad, narrowed at the base; the apical joint narrower than the preceding, acuminate at the apex. The labrum about twice as long as broad, membranous, the middle of the front margin very deeply incised, fringed with stiff hair, and with some long stiff bristles arising from behind the margin. The anterior angles of the thorax are very much directed downwards and are rather obtuse, and are not visible when viewing the insect from above, in which position the thorax has a nearly circular outline. The under reflexed shining margins parallel as far as the front angles. Intermediate coxæ slightly separated. Tarsi rather slender.

*DIAPHGETES RUGOSUS*, n. sp. (Plate XVI. fig. 1.)

Nearly black; sparingly clothed with pubescence, which is chiefly brown, but on the shoulders of the elytra, the basal segment of the abdomen, and the margin of the penultimate segment, and on the tibiæ is golden. Head, thorax, and elytra densely and very strongly punctured, the punctures on the disk of the thorax having a tendency to run together longitudinally. The punctuation of the abdomen is much less strong and less close. Head a little broader than long, about two thirds the width of the thorax; the cheek behind each eye is much less than the length of the eye, the posterior angle rounded. Thorax rounded at the sides and behind; in the middle of the base there is a short smooth spot. Elytra as long as the thorax, but distinctly broader, with an indication of a sutural stria. Legs pubescent, the middle tibiæ beset with small blackish spines on the outer side.

Length 6 lines.

*Hab.* Larat.

PASSALIDÆ.

*LEPTAULAX TIMORIENSIS*, Perch.

The specimens in the British-Museum collection are from India, Philippine Is., Java, Amboyna, Celebes, &c.

*Hab.* Larat.

DYNASTIDÆ.

*ORYCTES RHINOCEROS*, Linn.

Found in all the neighbouring islands.

*Hab.* Maroe.

*HORONOTUS DEILOPHUS*, Sharp.

This species was described from the Philippine Islands. The specimens found by Mr. Forbes are small males, but do not differ materially from the Philippine examples.

*Hab.* Maroe and Larat.

## BUPRESTIDÆ.

## CYPHOGASTRA ANGULICOLLIS, Deyr.

This species was described from Banda. The specimen before me from Larat agrees well with examples from Banda, but the copper colour on the suture of the elytra does not extend quite to the scutellum.

## CYPHOGASTRA SPLENDENS, n. sp. (Plate XVI. fig. 2.)

Very close to *C. angulicollis*, and of the same form, but with a different distribution of colour. The thorax is bright coppery, with more or less golden green on the disk. The elytra have the dorsal region very dark steel-blue (appearing almost black), this blue colour, making an elongate triangular patch (common to both elytra), broadest at the base and narrowing posteriorly, terminates at about one third from the apex; next there is on each elytron a broad oblique coppery-red stripe (margined on its inner side by golden green), commencing on the shoulder, extending to near the apex (where it touches the suture), but then turned suddenly to the lateral margin of the elytron; the side of the elytron (from below the shoulder to where it meets the turn of the coppery stripe) is dark blue; the extreme apex is blue-black.

Length  $17\frac{1}{2}$  lines.

Hab. Maroe.

## ELATERIDÆ.

## ADELOCERA CINCTA, Candèze.

The specimen before me agrees well with the description given (C. R. Soc. Ent. Belg. 1878, p. lii) of this species from Sumatra. The allied species has a wide range.

Hab. Maroe.

## BOSTRICHIDÆ.

## BOSTRICHUS ÆQUALIS, n. sp. (Plate XVI. fig. 3.)

Elongate, parallel, convex, shining; black, with the elytra and legs obscure pitchy, antennæ paler. Head densely and finely granular; the epistoma less opaque, closely and finely punctured. Thorax with the basal half parallel, very convex; the front half obliquely narrowed anteriorly, sloping down, with six teeth on each margin, the anterior pair slightly porrect, the space between them emarginate. The surface posteriorly is marked with moderately large, deep punctures, which are irregularly placed, the intervals irregularly and extremely finely and rather sparingly punctured; all the front part is asperate. The posterior angles very slightly conically produced and diverging. Elytra of the same width as the thorax, scarcely broader posteriorly, very abruptly deflexed at the apex; deeply and strongly punctured, the punctures rather close together, placed irregularly near the suture, but having towards the sides a tendency to form lines; the interspaces smooth and shining, less than the diameter of the punctures (except here

and there in the longitudinal direction, when the intervals are equal to the diameter of the punctures); at rather remote intervals very minute punctures may be seen. At the upper part of the posterior declivity, on each elytron, are two short, scarcely noticeable costæ; the extreme apex is slightly reflexed, dull. The first joint of the club of the antennæ is a little longer than broad, the second as long as broad, the third elongate-ovate. The anterior angles of the metasternum, and the metasternal epipleura are densely and very finely granular. The abdomen is closely and finely punctured, and very delicately pubescent. The tarsi are not very long as compared with some of the species of this genus.

Length 5 lines.

*Hab.* Maroe.

#### TENEBRIONIDÆ.

##### OPATRUM, sp.

A species closely resembling the African *O. micans*, Germ., and perhaps identical and introduced.

*Hab.* Maroe.

##### BRADYMERUS, sp.

A species of this difficult genus which I am unable to determine.

*Hab.* Maroe.

##### TOXICUM GAZELLA, Fabr.

The examples agree well with specimens of this species in the British Museum from Malacca.

*Hab.* Maroe.

##### TOXICUM QUADRICORNE, Fabr.

The specimens in the British Museum are from Penang, Java, Philippine Is., and Borneo.

*Hab.* Maroe.

##### AMARYGMUS, sp.

A single species of this very difficult genus, which I cannot determine.

*Hab.* Maroe.

##### PEDIRIS SUBOPACUS, n. sp.

Closely allied to *P. (Nyctobates) sulciger*, Boisd., but less shining. Entirely black; the head much more closely and rather more strongly punctured than in *P. sulciger*, especially on the vertex. Thorax slightly shining only in the middle; the impression on each side of the middle much less marked than in *P. sulciger*, the punctuation more distinct. Elytra somewhat dull; the striae nearest to the suture very lightly impressed (except at the extreme apex); the

lateral ones deeper, but much less so than in *P. sulciger*; the first three interstices flat, the lateral ones very slightly arched, much less than in *P. sulciger*.

Length 16 lines.

*Hab.* Maroe.

#### CURCULIONIDÆ.

*ORTHORRHINUS LETUS*, Saund. & Jekel.

The type of this species is from the New Hebrides.

*Hab.* Maroe.

*SPHENOPHORUS OBSCURUS*, Boisd.

A widely distributed species.

*Hab.* Larat.

#### PRIONIDÆ.

*ARCHETYPUS CASTANEUS*, n. sp. (Plate XVI. fig. 4.)

Dark chestnut-brown, the head and mandibles inclined to black; the legs and abdomen pitchy yellow. Mandibles nearly as long as the head, very robust, convex, strongly punctured; on the inner side and the epistoma clothed with fulvous hair. Head shining above, dull at the sides, with a longitudinal impressed line in the middle; with some strong punctures above, rugose at the sides. Thorax wider than the head; at its broadest part (just before the anterior angles) a little more than twice as broad as long, narrowed posteriorly, shining; the disk flat, moderately strongly but not closely punctured, with a smooth spot in the middle; the sides sloping down; the shining surface of the disk continued down the side in a triangular shape to near the margin; the rest of the side impressed, dull and densely punctured. Scutellum smooth. Elytra at the base a little broader than the base of the thorax, gradually widened posteriorly for two thirds their length, and then again narrowed, the apex broad and obtusely rounded; shining, strongly and moderately closely punctured, except near the scutellum, where the punctuation is very delicate. Each elytron has a fine, slightly oblique, raised line about the middle, commencing within the shoulder and not extending to the apex. Submentum very closely and very coarsely rugose.

Length  $16\frac{1}{2}$  lines.

*Hab.* Maroe.

#### CERAMBYCIDÆ.

*PACHYDISSUS HOLOSERICEUS*, Fabr.

Occurs in many of the neighbouring islands.

*Hab.* Maroe.

*DIATOMOCEPHALA PACHYMERA*, Pascoe.

The specimens of this species in the British Museum are from Celebes and Waigiou.

*Hab.* Larat.

## LAMIIDÆ.

## TMESISTERNUS GLAUCUS, Pascoe ?

I am not sure of the identity of Mr. Forbes's specimen with the species described by Mr. Pascoe. It has more yellow colour on the abdomen.

*Hab.* Maroe.

## PELARGODERUS RUGOSUS, n. sp.

Nearly black; head coarsely rugose, with sandy yellow pubescence round and beneath the eyes. Basal joint of the antennæ very rugose, not much narrowed at its base. Thorax rugose, rather dull, with scarcely any trace of lateral spine, sparingly pubescent; the pubescence forming a narrow sandy line on each side of the middle. Elytra with the basal half rather strongly punctured, those at the base generally marked by a shining granule; the posterior half is more closely and more rugosely punctured. The basal half and the sides are rather closely marked with irregular small spots of sandy pubescence, but at about one quarter from the base there is near the suture an oblique bare patch. A little behind the middle there is a rather large oblique bare patch, which extends from the side to the suture; and behind this there is a patch of pale sandy pubescence, not quite touching the side, but reaching the suture and the apex. The apex of each elytron is obliquely truncate, the outer angle obtuse.

Length 18 lines.

*Hab.* Larat.

This species is very close to *P. arouensis*, Th., but is more robust, much more rugosely sculptured on the head and thorax; and the basal joint of the antennæ is less narrowed at the base and more rugose.

## NEMOPHAS FORBESI, n. sp. (Plate XVI. fig. 5.)

Black, with the elytra bright steel-blue; the thorax entirely clothed with sandy yellow pile; the elytra with numerous more or less interrupted bands of reddish ochreous pubescence.

Length 17-20 lines.

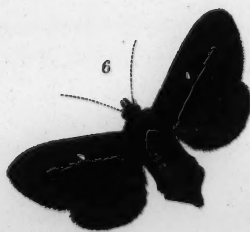
This species is close to *N. grayii*, Pascoe, but has no trace of blue colour in the head and antennæ. The thorax is entirely covered with the yellow pile, with no black at the base. The bands of the elytra are more numerous, generally about seven, and these are more irregular. And lastly, the sterna, epimera, and the basal segments of the abdomen are more or less clothed with reddish pubescence.

*Hab.* Maroe and Larat.

## BATOCERA RUBUS, Fabr., var. ?

The specimen from Larat is a little larger than *B. rubus* usually is, and has the scutellum clothed with fulvous instead of white pubescence.





W. Purkiss lith.

Hanhart imp

WEST AFRICAN LEPIDOPTERA.

**COPTOPS FUSCA**, Oliv. ?

A single specimen from Maroe which I cannot separate from the African *C. fusca*, and which is therefore doubtlessly introduced.

**SYMPHYLETES PEDICORNIS**, Fabr.

An Australian species introduced.

*Hab.* Maroe.

**PRAONETHA PLEURICAUSTA**, Pascoe.

I can see no difference between the specimen brought by Mr. Forbes and that described by Mr. Pascoe from Port Albany, N. Australia.

*Hab.* Maroe.

**CHRYSONELIDÆ.****PHYLLOCHARIS CYANIPES**, Fabr.

This species occurs in Australia, New Guinea, Bouru, &c.

*Hab.* Maroe.

**EXPLANATION OF PLATE XVI.**

- Fig. 1. *Diaphates rugosus*, p. 214. a, labrum; b, labium; c, maxilla.  
 2. *Cyphogastra splendens*, p. 215.  
 3. *Bostrichus æqualis*, p. 215.  
 4. *Archetypus castaneus*, p. 217.  
 5. *Nemophas forbesi*, p. 218.

4. On the Lepidoptera collected by the late W. A. Forbes on the Banks of the Lower Niger.—RHOPALOCERA by F. D. GODMAN and O. SALVIN. HETEROCERA by H. DRUCE.

[Received March 28, 1884.]

(Plate XVII.)

**RHOPALOCERA.**

The collection of Butterflies made by the late W. A. Forbes during his expedition to the Niger, contains fifty species, and comprises representatives of all the Families of Rhopalocera hitherto known from Tropical Africa except the Erycinidæ, a group but feebly developed in this region.

The specimens of this collection are generally in poor condition and have the appearance of having been captured at a season when fresh examples were not to be obtained. From this cause, and probably also from the low-lying nature of the country, many of the more conspicuous species known from the adjoining districts of Old Calabar and the Camaroon Mountains, are absent from the present collection.

On comparison with the Lepidopterous Faunas of the places just mentioned, and we may also say of the West coast of Africa generally,

we detect no signs of any notable peculiarities; indeed the majority of the species are also found over a wide extent of the African continent, some spreading to the Cape Colony, others to East Africa, and even to the valley of the Nile and Abyssinia.

We have ventured to describe as new two species of *Acræa*, both rather obscure forms, of one of which we have long possessed several examples.

## Nymphalidæ.

### Danainæ.

#### 1. *DANAIS ALCIPPUS*.

*Papilio alcippus*, Cram. Pap. Ex. t. 127. f. E, F.

*Danais alcippus*, Butl. P. Z. S. 1866, p. 46.

Several specimens of this form of *D. chrysippus*, agreeing with others from Abyssinia and elsewhere.

### Satyrinæ.

#### 2. *MYCALESIS VULGARIS*.

*Mycalesis vulgaris*, Butl. Cat. Sat. B. M. p. 130, t. 3. f. 2.

A single specimen, agreeing with the type in the British Museum.

#### 3. *MYCALESIS DOLETA*.

*Mycalesis doleta*, Kirby, Proc. Roy. Dubl. Soc. (2) ii. p. 336 (1880).

Agrees with specimens thus named in the British Museum.

#### 4. *MYCALESIS DESOLATA*.

*Mycalesis desolata*, Butl. Ann. & Mag. Nat. Hist. (4) xviii. p. 480.

Compared with Mr. Butler's types from Abyssinia.

#### 5. *MYCALESIS RÆSACES*.

*Mycalesis ræsaces*, Hew. Ex. Butt. (*Mycalesis*), t. 8. f. 51, 52.

Agrees with Old-Calabar specimens whence Hewitson's types were derived.

#### 6. *YPHITHIMA ITONIA*.

*Ypthima itonia*, Hew. Trans. Ent. Soc. (3) ii. p. 287, t. 18. f. 13.

Hewitson's types came from the White Nile. They differ from Forbes's specimens in having the submarginal ocelli of the secondaries decidedly larger, a character of small importance in species of this and the allied genera.

### Acraeinæ.

#### 7. *ACRÆA LYCIA*.

*Papilio lycia*, Fabr. Syst. Ent. p. 464.

There are a number of examples in the collection of both sexes this very common African insect.

8. *ACRÆA DAIRA*, sp. n. (Plate XVII. fig. 3.)

*Alis rosaceis extus fusco indistincte limbatis; anticis fascia transversa subapicali pallide rosacea et maculis novem nigris notatis, una cellulari, altera ad finem ejus, quatuor in linea arcuata ultra eam, duabus inter ramos medianos ad angulum analem et una inter venas medianam et submedianam; posticis ad basin nigro maculatis et fascia macularum octo nigrarum margini externo subparallela notatis; subtus ut supra, alis inter venas ad marginem externum rubro notatis. Antennis nigris, palpis rosaceis apice nigro; thorace et prothorace fuscis rosaceo notatis, abdomine supra medialiter fusco.*

Exp. 2·2 inches.

*Hab.* ad ripas fl. Niger (*W. A. Forbes*).

*Mus.* nostr.

Of this species Forbes's collection contains only a single specimen, but we have others, which are hardly distinguishable from it, from Zanzibar. Its nearest ally seems to be *A. lycia*, from which it differs at first sight by its more rufous tint, which colour also pervades the transverse subapical light spot of the primaries, so that it is hardly to be distinguished from the other markings of the wing.

9. *ACRÆA CÆCILIA*.

*Papilio cæcilia*, Fabr. Spec. Ins. ii. p. 34.

This is also a species of wide range in West Africa, whence it passes eastward to the White Nile.

10. *ACRÆA CALYCE*, sp. n. (Plate XVII. figs. 1, 2.)

♂. *Alis rosaceis, anticis interdum fuscis sed area apicali interna semper semihyalina; macula cellulari, aliis tribus (una ad cellula finem duabus infra eam in linea transversa positus) et quatuor ultra cellulam nigris; posticis dense (præcipue ad basin) nigro maculatis, margine externo nigro maculas rosaceas includente; subtus ut supra, sed anticis vitreo micantibus, posticis ad medium glaucescentibus. Antennis nigris, palpis omnino albido rosaceis; abdominis dimidio postico rubido.*

Exp. 2·3 inches.

*Hab.* ad ripas fl. Niger (*W. A. Forbes*); Cape Coast Castle, Dahomey.

*Mus.* nostr.

Several specimens of a species allied to *A. adnatha*, Hew., for which we have not been able to find a name. We have other examples from Cape Coast Castle and from Dahomey, showing that the species is probably far from uncommon in this region. The specimens vary a good deal *inter se*, the basal half of the primaries being more rufous in some specimens than in others. The rufous submarginal spots of the primaries also vary in distinctness.

11. *ACRÆA PSEUDEGINA*.

*Acræa pseudegina*, Westw. Gen. Diurn. Lep. p. 531.

*Papilio egina*, Stoll (nec Cram.), Suppl. Cram. t. 25. f. 3, 3 c.

A common species at Sierra Leone.

12. *ACRÆA LYCOA*.

*Acræa lycoa*, Godt. Enc. Méth. ix. p. 239.

A single broken specimen belonging to this species.

13. *ACRÆA VINIDIA*.

*Acræa vinidia*, Hew. Ent. Monthl. Mag. 1874, p. 130; Ex. Butt. *Acræa*, t. 7. f. 45, 46.

Four specimens in the collection, from Lukoja, seem to agree best with this species, as they have an isolated subapical fulvous spot on the primaries. But there are several closely allied forms, the characters of which are not very definite.

14. *ACRÆA SERENA*.

*Papilio serena*, Fabr. Syst. Ent. p. 461.

A common African species, having a very wide range.

## NYMPHALINÆ.

15. *ATELLA EURYTIS*.

*Atella eurytis*, Doubl. Gen. Diurn. Lep. t. 22. f. 3.

Two examples of this very common insect.

16. *JUNONIA CLELIA*.

*Papilio clelia*, Cram. Pap. Exot. t. 21. f. E, F.

*Junonia clelia*, Trim. Rhop. Afr. Austr. p. 128.

Three specimens of this common African Butterfly.

17. *PRECIS TEREÆ*.

*Papilio tereæ*, Drury, Ill. Exot. Ent. t. 18. f. 3, 4.

A specimen in poor condition.

18. *PRECIS SOPHIA*.

*Papilio sophia*, Fabr. Ent. Syst. iii. p. 248; Donov. Ins. Ind. t. 36. f. 3.

Two specimens.

19. *HYPANIS ILITHYIA*.

*Papilio ilithyia*, Drury, Ill. Nat. Hist. ii. t. 17. f. 1, 2.

*Hypanis ilithyia*, Trimen, Rhop. Afr. Austr. p. 214.

Two specimens of this very variable species.

20. *DIADEMA MISIPPUS*.

*Papilio misippus*, Linn. Mus. Ulr. p. 264.

*Hypolimnas misippus*, Aurivill. Kongl. Sv. Vet.-Ak. Handl. xix. No. 5, p. 71.

Two males of the ordinary form of this very widely distributed species.

21. *DIADEMA ANTHEDON*.

*Diadema anthedon*, Doubl. Ann. & Mag. Nat. Hist. xvi. p. 181.

A male and female of the typical West-African form. The female differs from the male in having a large discal white patch divided by the nervures on the primaries, beyond which is a transverse row of white spots, and towards the apex two small white spots; the inner margin is black, and the distal half of the secondaries fuscous. The sexes, though obviously distinct in their markings, are not strongly contrasted as in *D. bolina*.

22. *NEPTIS AGATHA*.

*Papilio agatha*, Cram. Pap. Exot. t. 327. f. A, B.

*Neptis melicerta* (Fabr., nec Drury), Trimen. Rhop. Afr. Austr. p. 146.

Several specimens of this common species of *Neptis* are included in the collection.

23. *ROMALEOSOMA AGNES?*

*Romaleosoma agnes*, Butl. Trans. Ent. Soc. p. 672.

A male specimen, probably of this species, which is very closely allied to *R. medon* (Linn.).

The males of these two Butterflies are undistinguishable so far as we can see; but the female of *R. agnes*, upon which sex Mr. Butler founded his name, has a darker and more restricted purple patch to the secondaries than the female of *R. medon*. The former seems to be the prevalent form at Old Calabar and its vicinity, whilst the latter seems to be more common in Angola. On this account we have named Forbes's specimen *R. agnes*.

24. *HAMANUMIDA DÆDALUS*.

*Papilio dædalus*, Fabr. Syst. Ent. p. 482.

*Papilio meleagris*, Cram. Pap. Exot. t. 66. f. A, B.

*Aterica meleagris*, Trimen, Rhop. Afr. Austr. p. 157.

A widely ranging species, of which two specimens are in the collection.

25. *CHARAXES EPIJASius*.

*Charaxes cpijasius*, Reiche, Ferr. Gal. Voy. Abyss., Ent. p. 469, t. 32. f. 1, 2.

This species was described from Abyssinian specimens, but has been since traced to Senegal.

## LYCÆNIDÆ.

26. *LYCÆNA HIPPOCRATES*.

*Hesperia hippocrates*, Fabr. Ent. Syst. iii. p. 288.

*Papilio hippocrates*, Donovan. Ins. Ind. t. 45. f. 3.

Two male specimens.

27. *LYCÆNA LINGEUS*.*Papilio lingeus*, Cr. Pap. Ex. t. 379. f. F, G.*Lycæna lingeus*, Trim. Rhop. Afr. Austr. p. 239.

Two specimens of this widely spread species.

28. *LYCÆNA KNYNSA*.*Lycæna knysna*, Trim. Trans. Ent. Soc. ser. 3, i. p. 282; Rhop. Afr. Austr. p. 255.

Several specimens.

29. *LYCÆNA PRINCEPS*.*Lycænesthes princeps*, Butl. Ann. & Mag. N. H. (4) xviii. p. 484.

Several specimens agreeing with others thus named in Capt. Shelley's collection. Mr. Butler's types came from Abyssinia.

30. *LYCÆNA PULCHRA*.*Lycæna pulchra*, Murr. Trans. Ent. Soc. 1874, p. 524, t. 10. f. 7, 8.

Several specimens of both sexes, agreeing well with Mr. Murray's figures.

31. *LUCIA (?) DELEGORGUEI*.*Lycæna delegorguei*, Boisd. in Delegorgue's Voy. dans l'Afr. austr. ii. p. 588.*Lucia (?) delegorguei*, Trimen, Rhop. Afr. Austr. p. 280.

One damaged specimen apparently of this species.

Mr. Kirby, probably following a suggestion of Mr. Butler's, refers this name to *Hesperia bibulus*, Fabr., but Donovan's representation of this insect is hardly intelligible.32. *PITHECOPS (?) ELOREA*.*Papilio elorea*, Fabr. Ent. Syst. iii. p. 194; Donov. Nat. Rep. ii. t. 53.*Pithecopis elorea*, Butl. Cat. Fabr. Diurn. Lep. p. 161.Mr. Butler has placed this species in *Pithecopis*, and we follow him in so doing. A close examination of its structure, however, is required to determine its true position. There is considerable individual variation in the width of the dark margin of the secondaries. Forbes's specimens all have this margin comparatively broad.33. *CIGARITIS AMINE*.*Cigaritis amine*, Butl. Trans. Ent. Soc. 1874, p. 533, t. 11. f. 1, 2.

A single specimen of this pretty species, which Mr. Butler described from examples taken at Whydah on the Gold Coast.

34. *MYRINA NOMENIA*.*Myrina nomenia*, Hew. Trans. Ent. Soc. 1874, p. 353; Ill. Diurn. Lep., Suppl. p. 25, t. iii. b. f. 105, 106.

One damaged specimen of this species.

## 35. DEUDORIX, sp.

A single specimen of a species apparently of this genus. We have not been able to find a name for it; but do not describe it from such scanty materials.

## PAPILIONIDÆ.

## PIERINÆ.

## 36. PONTIA ALCESTA.

*Papilio alcesta*, Cr. Pap. Ex. t. 379. f. A.

*Pontia alcesta*, Trim. Rhop. Afr. Austr. p. 26.

Several specimens, agreeing with others from West and South Africa.

## 37. TERIAS, sp.

*Terias rahel*, Trim. Rhop. Afr. Austr. p. 76 (nec Fabricius).

Several specimens of this species, to which we have not been able to attach a name. It is evidently the *T. rahel* of Mr. Trimen's work, but not the species so named by Fabricius, as Mr. Butler has pointed out (Cat. Fabr. Diurn. Lep. p. 227). It has close allies in *T. pulchella* of Madagascar, and *T. floricola* of Eastern Africa.

## 38. TERIAS BRIGITTA.

*Papilio brigitta*, Cr. Pap. Ex. t. 331. f. B, C.

*Terias brigitta*, Trim. Rhop. Afr. Austr. p. 80.

Forbes's three specimens agree well with Cramer's figure of this species.

## 39. TERIAS, sp.

Several specimens, which resemble *T. senegalensis*, Hübn.; but we hesitate to pronounce them identical, the colour of the upperside being paler and the markings of the underside very much less distinct. *T. desjardinsii* is another allied South-African species.

## 40. PIERIS CALYPSO.

*Papilio calypso*, Drury, Ill. Nat. Hist. ii. p. 29, t. 17. f. 3, 4.

*Pieris calypso*, Trim. Rhop. Afr. Austr. p. 38.

A well-known West-African species, of which Forbes's collection contains several examples.

## 41. PIERIS CREONA.

*Papilio creona*, Cr. Pap. Exot. t. 95. f. C-F.

*Pieris creona*, Trim. Rhop. Afr. Austr. p. 31.

This is another common African *Pieris*, of which Forbes's collection contains a pair.

## 42. TACHYRIS CHLORIS.

*Papilio chloris*, Fabr. Syst. Ent. p. 473.

*Pieris chloris*, Trim. Rhop. Afr. Austr. p. 28.

A pair.

## 43. TACHYRIS SABA.

*Papilio saba*, Fabr. Sp. Ins. ii. p. 46.

A pair of this species, agreeing with our series of West-African examples.

## 44. CALLIDRYAS PYRENE.

*Colias pyrene*, Sw. Zool. Ill. ser. 1, t. 51.

*Callidryas pyrene*, Butl. Lep. Ex. t. 16. f. 8, 9, 10.

*Callidryas florella*, Boisd. Sp. Gén. i. p. 608 (nec Fabr. apud Butler).

A single male specimen, which, according to Mr. Butler, should bear this name.

## 45. TERACOLUS EVIPPE.

*Papilio evippe*, Linn. Mus. Ulr. p. 239.

*Callosune evippe*, Auriv. Kongl. Sv. Vet.-Ak. Handl. xix. No. 5, p. 52.

A male example.

## PAPILIONINÆ.

## 46. PAPILIO DEMOLEUS.

*Papilio demoleus*, Linn. Mus. Ulr. p. 214; Auriv. Kongl. Sv. Vet.-Ak. Handl. xix. No. 5, p. 33.

Several specimens of this common African species.

## 47. PAPILIO PYLADES.

*Papilio pylades*, Fabr. Ent. Syst. iii. p. 34; Donovan. Nat. Rep. i. t. 13; Trim. Rhop. Afr. Austr. p. 22.

Forbes's single specimen resembles Donovan's figure except that the dark costal border of the primaries near the base is broader and there is no red spot at the anal angle of the secondaries. The species is a variable one, and we agree with Mr. Trimen that it cannot be satisfactorily divided.

## 48. PAPILIO MEROPE.

*Papilio merope*, Cr. Pap. Ex. t. 378. f. D, E; Trim. Trans. Linn. Soc. xxvi. p. 506 et seq.

*Papilio hippocoon*, Fabr. Syst. Ent. iii. p. 38; Hew. Ex. Butt. Pap. t. 12. f. 38.

Forbes's collection contains three specimens of this species, two males and one female. The former agree with Sierra-Leone examples, which should be considered the typical *P. merope*, Cr. The female is like typical *P. hippocoon*, Fabr., from the same country. This form of female has a wide range in Africa, extending to the Cape Colony (Trimen) and in East Africa to Zanzibar.

## HESPERIDÆ.

## 49. PYRGUS VINDEX.

*Papilio vindex*, Cr. Pap. Ex. t. 353. f. G, H.

*Pyrgus vindex*, Doubl. & Hew. Gen. Diurn. Lep. t. 79. f. 6;  
Trim. Rhop. Afr. Austr. p. 287.

A single specimen.

## 50. PAMPHILA BORBONICA.

*Hesperia borbonica*, Boisd. Faun. Mad. p. 65, t. 9. f. 5, 6.

*Pamphila borbonica*, Trim. Rhop. Afr. Austr. p. 303.

Two specimens.

## HETEROCERA. By H. DRUCE.

## AGARISTIDÆ.

1. *ÆGOCERA LATREILLII*, Herrich-Schäffer, Aussl. Schmett.  
t. 5. fig. 19.

*Ægocera magna*, Walk. Cat. i. p. 56.

2. *ÆGOCERA RECTILINEA*, Boisd. Spec. gén. Lép. i. t. 14.  
fig. 5.

## ARCTIIDÆ.

3. *ALOA PUNCTIVITTA*, Walk. Cat. iii. p. 673.

The specimens agree well with the type in the British Museum  
from South Africa.

## NYCTEMERIDÆ.

4. *ALETIS FORBESI*, sp. n. (Plate XVII. fig. 4.)

Pale chrome yellow; primaries with the apical third black, including a transverse white patch and two posterior white spots. Secondaries with a narrow marginal black band, which includes seven elongated white spots. Antennæ of male black, deeply pectinated. The thorax I believe to be black, but it is so much rubbed that I cannot be certain upon this point. Abdomen yellow, with the segments banded with black. Legs yellow. The undersides the same as above. The female agrees in all respects with the male, except that the antennæ are not pectinated. Expanse  $1\frac{3}{4}$  inch.

A small species, very distinct from any described. I have had two specimens in my collection for some time, one from Old Calabar and the other from the Cameroons: they agree in all respects with those from the Niger. The Cameroons example is a female; it is rather larger, measuring nearly two inches across the wings.

## LITHOSIIDÆ.

5. *DEIOPEIA PULCHELLA*, Linn. Syst. Nat. i. 2. 884, 349.

## LIPARIDÆ.

6. *DASYCHIRA CRAUSIS*, sp. n. (Plate XVII. fig 5.)

♀. Primaries—the ground-colour chrome-yellow, very thickly powdered with minute black spots excepting at the apex, and the outer margin crossed by four irregular bands of orange-red—the first close to the base and nearly straight, the second curved, the third broad and almost broken into three spots, the fourth very much curved near the apex; between the third and fourth bands, at the end of the cell, is a large red spot. Secondaries uniform chrome-yellow, the fringe yellow. Head and palpi yellow, tipped with black; antennæ somewhat deeply pectinated, brownish black. Thorax and abdomen I believe to be yellow banded with black, but the specimen being much rubbed in these parts I cannot be certain about the black bands. Legs yellow; the tarsi black. The underside uniform chrome-yellow, with an indistinct black mark at the end of the cell of both the primaries and secondaries. Expanse  $1\frac{3}{4}$  inch.

This species is allied to *D. gentilis*, Butler, from Madagascar; but it is a much smaller insect and very distinct. A specimen, in very bad condition, of what I believe to be the male of this species is in the British-Museum collection from Old Calabar.

## NOTODONTIDÆ.

7. *ORÆSIA*, sp. ?

A specimen of a species very closely allied to *O. alliciens*, Walk., from which it differs in having the primaries much paler and without the transverse lines. As only a single example was obtained, and the species of this genus are subject to slight variation, I think it better not to name this insect without seeing more specimens.

## LIMACODIDÆ.

8. *PARASA*, sp. ?

A specimen in very poor condition belonging to this genus.

## BOMBYCIDÆ.

9. *PACHYGASTRIA NIRIS*, sp. n. (Plate XVIII. fig. 6.)

Uniform reddish brown; primaries with a minute white spot, edged with black, at the end of the cell, two transverse narrow black bands crossing the wing beyond the middle; secondaries rather paler at the base, crossed at the middle by a very faint black line. Underside paler and with the black lines more defined. Expanse  $1\frac{1}{2}$  inch.

This species is allied to *P. reducta*, Walk., from the Zulu Country, South Africa.

## XYLOPHASIDÆ.

10. *SPODOPTERA CAPICOLA*, Herr.-Schäff. Exot. Schmett. t. 27. fig. 131.

## APAMEINÆ.

11. *APAMEA NATALENSIS*, Butler, Ann. & Mag. Nat. Hist. ser. iv. vol. xvi. p. 403.

A very broken example of this species.

## XYLINIDÆ.

- 12.
- EPIMECIA ÆNIGMA*
- , Feld. Lep. Nov. t. 108. f. 47.

A single example of this species in very poor condition was sent.

## TOXOCAMPIDÆ.

- 13.
- TOXOCAMPA*
- , sp. ?

A specimen of a species very close to *T. salax*, Guén., from which it chiefly differs by wanting the black collar of that species. It is not in good condition; I therefore think it better not to describe it.

## OPHIDERIDÆ.

- 14.
- OPHIDERES MATERNA*
- , Linn. Syst. Nat. ii. 840. 117.

## EUCLIDIDÆ.

- 15.
- CHALCIOPE DELTIFERA*
- , Feld. Lep. Nov. t. 117. fig. 24.

Two specimens in bad condition, agreeing well with Dr. Felder's figure.

## REMIGIDÆ.

- 16.
- REMIGIA PELLITA*
- , Guén. Noct. iii. p. 318.

## THERMESIDÆ.

- 17.
- THERMESIA*
- , sp. ?

A single example of a species belonging to this genus.

## HYPENIDÆ.

- 18.
- HYPENA CONSCITALIS*
- , Walk. Cat. xxxiv. p. 1509.

A poor example, agreeing well with Walker's type in the British Museum.

- 19.
- HYPENA ECHEONALIS*
- , Walk. Cat. xvi. p. 230.

## ASOPIDÆ.

- 20.
- DESMIA*
- ?

A single example in very bad condition belonging to this genus.

- 21.
- HYMENIA FASCIALIS*
- , Stoll, Cram. Pap. Exot. v. t. 36. fig. 13.

The collection contains examples of three or four other species; but the specimens are in such bad condition, it is quite impossible to identify them.

## EXPLANATION OF PLATE XVII.

Fig. 1. *Acraea calyce*, ♂, p. 221.

2. ———, ♀, p. 221.

3. — *daira*, p. 221.

4. *Aletis forbesi*, p. 227.

5. *Dasychira crausis*, p. 228.

6. *Pachygastris niris*, p. 228.

5. Descriptions of three rare Species of Flycatchers. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received March 29, 1884.]

Count Salvadori has recently forwarded for my inspection some very interesting birds collected by the late Marquis Antinori during the Italian Expedition to Shoa.

One of the Flycatchers in the collection is an *Alseonax*, which Count Salvadori considers to be *A. minima* of Heuglin. It is, however, brown instead of grey on the upper surface, and in several points does not agree with Heuglin's description, nor yet with his plate, which, again, differs from his description. The fulvous eyebrow, thighs, and under tail-coverts are all depicted in the plate, although the description does not tally with the figure in this respect; but as these points are strongly marked in the specimen lent me by Count Salvadori, I suppose it must be referred to *A. minima*. I consider the latter to have been so badly described as quite to justify the opinion of Drs. Finsch and Hartlaub that it was probably referable to *Alseonax adusta*. I therefore append an amended description.

#### 1. ALSEONAX MINIMA.

*Muscicapa minuta*, Heugl. Syst. Uebers. p. 31 (1856).

*Muscicapa minima*, Heugl. J. f. O. 1862, p. 301; Finsch & Hartl. Vög. Ostaf. p. 303, note (1870); Heugl. Orn. N.O.-Afr. ii. p. 435, Taf. xviii. fig. 1 (1871).

*Muscicapa fuscula*, Finsch, Trans. Z. S. vii. p. 245 (1870).

*Alseonax minima*, Sharpe, Cat. B. Brit. Mus. iv. p. 129, note (1879).

*Adult male* (Sciotalit, Shoa, March 19, 1878; Antinori). General colour above dark brown, slightly washed with ashy on the mantle and back, the rump and upper tail-coverts more rufescent in tinge; lesser wing-coverts like the back; median and greater series dark brown, with rufescent brown margins; bastard-wing and primary-coverts nearly uniform blackish, the paler margins obsolete; quills blackish brown, with scarcely perceptible paler edges, much more distinct on the secondaries; tail-feathers ashy brown, narrowly edged with a fringe of lighter ashy, the outer tail-feathers with a fringe of whitish at the tips; crown of head darker ashy than the back and indistinctly mottled with dusky brown centres to the feathers; base of forehead washed with tawny rufous; ear-coverts brown with a slight rufescent tinge, the shaft-lines paler; eyelid, feathers below the eye, lores, and a distinct superciliary line pale tawny rufous, as also the anterior portion of the cheeks; chin and upper throat dull whitish, slightly washed with rufous; lower throat brown, with a faint rufescent tinge, followed by a patch of dull white on the fore

neck; breast pale rufescent brown, washed with ashy, the centre of the breast rather paler and resembling the abdomen, which is clear creamy buff, deeper and slightly inclining to tawny on the under tail-coverts; sides of body, flanks, and thighs decidedly more tawny rufous; axillaries and under wing-coverts clear tawny rufous; quills dusky below, ashy rufous along the inner web; "bill horn-colour; feet ashy; iris dusky" (*Antinori*). Total length 4.55 inches, culmen 0.4, wing 2.4, tail 1.9, tarsus 0.55.

The second species of which a specimen has been lent to me by Count Salvadori has been, as pointed out to me by him, unaccountably left out of the 'Catalogue of Birds' both by myself and by Mr. Seebohm. It is the *Dryophila abyssinica* of Rüppell, a species placed by Von Heuglin in the genus *Sylvia*, but I consider it, after examination, to be a true *Lioptilus*. I also take the present opportunity to correct another omission in the 'Catalogue,' viz. that of *Parisoma* or *Egithalopsis galinieri*, a large species which I also refer to *Lioptilus*. The latter genus has therefore at present four species, and the 'Key to the species' will require amendment as follows:—

- a. Under tail-coverts not chestnut; white or ashy or olive.
  - a'. Head differing in colour from the back, which is warm brown; sides of face, throat, and breast slaty grey.
    - a". Crown of head black, contrasting with the back; upper and under mandible yellowish white in skin ..... *nigricapillus*, p. 231.
    - b". Crown of head dark slaty grey; under surface of body entirely grey with olive-brown flanks; back warm brown; bill horn-brown in skin, paler on lower mandible ..... *abyssinicus*, p. 231.
  - b'. Head like the back, ashy olive; throat whitish; breast and flanks ashy brown, the abdomen and under tail-coverts white ..... *olivascens*, p. 232.
- b. Under tail-coverts chestnut; head ashy brown like the back; forehead hoary whitish ..... *galinieri*, p. 232.

1. LIOPTILUS NIGRICAPILLUS (V.); Sharpe, Cat. B. iv. p. 262.

2. LIOPTILUS ABYSSINICUS.

*Dryophila abyssinica*, Rüpp. Neue Wirb. Taf. 40. fig. 2 (1835).

*Curruca abyssinica*, Rüpp. Syst. Uebers. p. 57 (1845).

*Aedon abyssinicus* (Rüpp.); Heugl. Syst. Uebers. p. 25 (1856).

*Sylvia habessinica*, Heugl. Orn. N.O.-Afr. i. p. 313 (1869).

*Adult female* (Sciotalit, Shoa, April 1, 1878; *Antinori*). General colour above warm brown, rather more ruddy on the lower back and rump; lesser wing-coverts rather more tawny rufous than the back; median and greater series dusky brown edged with tawny rufous; bastard-wing lighter and more ashy brown, washed externally with faint rufous; primary-coverts and quills dusky brown, edged with tawny rufous, inclining to ashy grey towards the end of the primaries; the inner secondaries more ashy, edged with the same colour as the back; tail-feathers ashy brown, edged with olive;

entire crown, nape, and hind neck all round dark slaty grey; lores, sides of face, ear-coverts, cheeks, and under surface of body paler slaty grey, much lighter on the centre of the abdomen; sides of body and flanks reddish brown; under tail-coverts light ashy grey, with hoary whitish edgings; axillaries and under wing-coverts ashy white, slightly washed with reddish or tawny buff; quills dusky brown below, ashy fulvous along the inner web; bill bluish, with the culmen and tip blackish horn-colour; feet and claws leaden grey; iris dusky crimson. Total length 5·8 inches, culmen 0·55, wing 2·85, tail 2·6, tarsus 0·9.

### 3. *LIOPTILUS OLIVASCENS* (Cass.); Sharpe, Cat. B. iv. p. 263.

The original specimen of Cassin's *Parisoma olivascens* came from Gaboon, and I refer with some hesitation an example collected by the late Governor Ussher, in Fantee, to this species. There are various small discrepancies between the specimen in question and Cassin's description, which, however, it is scarcely worth while to go into, as the identity of the Gaboon and Gold-Coast *Lioptili* can only be settled by an actual comparison of specimens from the two localities.

### 4. *LIOPTILUS GALINIERI*.

*Parisoma galinieri*, Guérin, Rev. Zool. 1843, p. 162; id. in Ferret et Galin. Voy. Abyss. Ois. vol. iii. p. 223, pl. 13 (1847); Gray, Gen. B. i. p. 194 (1847); Bp. Consp. i. p. 256 (1850).

*Parisoma frontale* (nec Heugl.), Rüpp. Syst. Uebers. p. 43, pl. 22 (1845).

*Crateropus melodus*, Heugl. J. f. O. 1862, p. 29.

*Agithalopsis galinieri*, Heine, J. f. O. 1859, p. 431; Heugl. Orn. N.O.-Afr. i. p. 395 (1869).

*Adult*. General colour above dark ashy olive-brown; wing-coverts like the back, the outer median ones rather clearer ashy; bastard-wing and primary-coverts uniform blackish brown; quills blackish brown, externally edged with ashy brown, paler towards the ends of the primaries; inner secondaries much browner; tail dark brown; head like the back, except on the forehead, which is hoary grey; lores dusky blackish, extending in a line just above the eye; feathers below the latter dusky; eyelid dull whitish; sides of face, ear-coverts, and cheeks dull ashy brown, rather clearer ashy on the breast and abdomen; lower flanks washed with orange-chestnut, like the vent and under tail-coverts; thighs dull ashy, washed with orange-chestnut; under wing-coverts and axillaries dull ashy; quills dusky below, ashy whitish along the edge of the inner web; "bill black, the cutting-edges of the mandibles whitish; orbits bare and of a lilac colour; feet rufescent dusky; iris crimson" (*Heuglin*). Total length 6·7 inches, culmen 0·6, wing 3·45, tail 3·2, tarsus 1·05.

*Spec. in Mus. Brit.*

α. Ad. sk.  
b. Ad. sk.

Shoa.  
Shoa (*Harris*).

Dr. Rüppell [C].  
India Museum.





2

J. Smit lith.

Hanhart imp.

CAPROMYS MELANURUS.



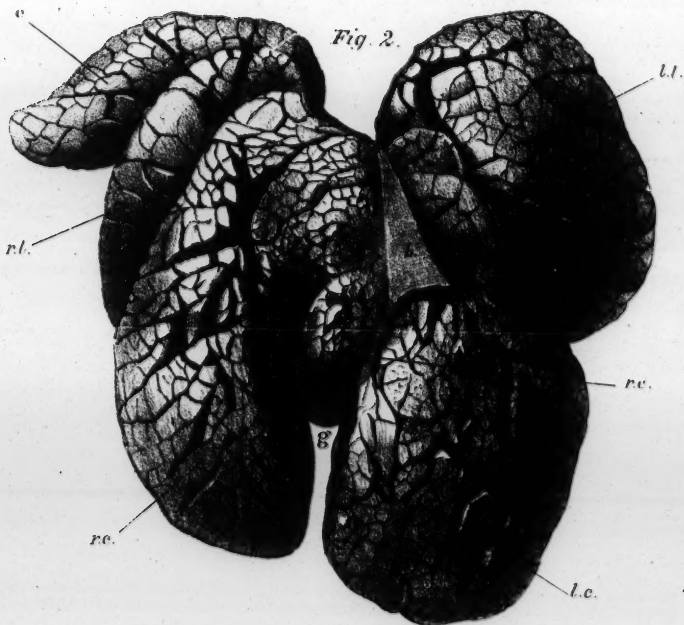
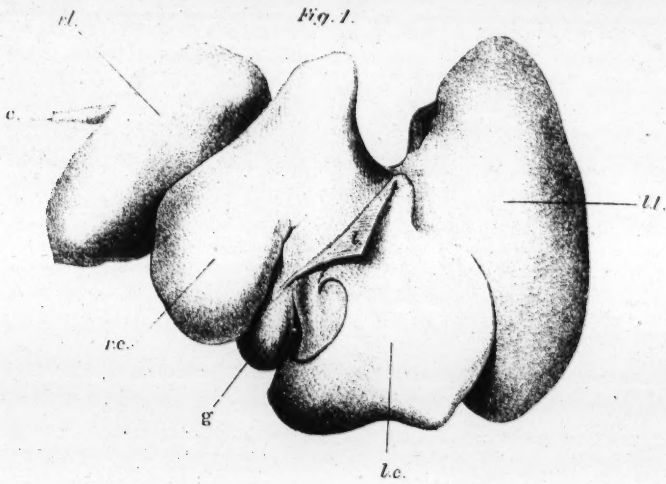




Fig. 1a

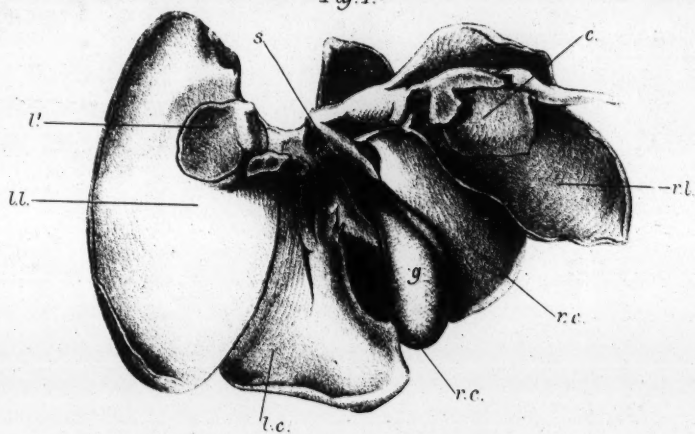
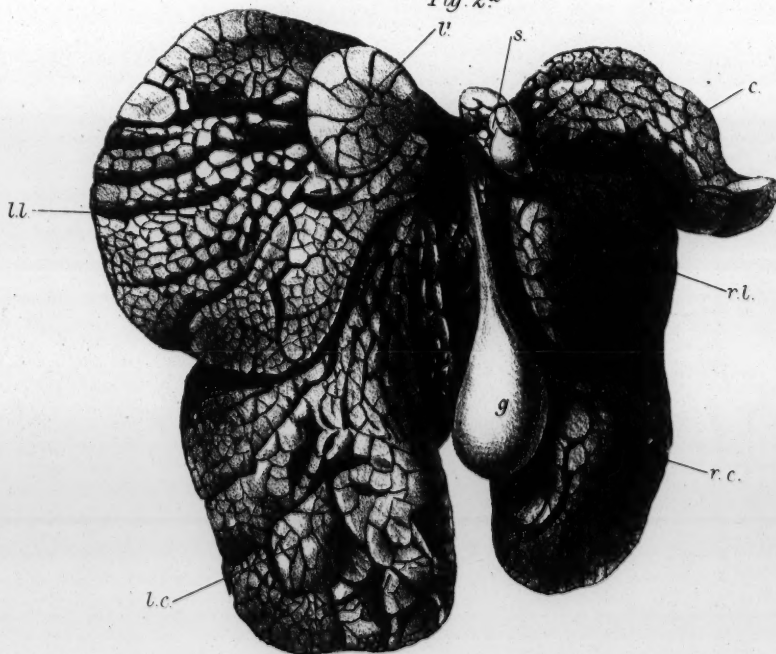
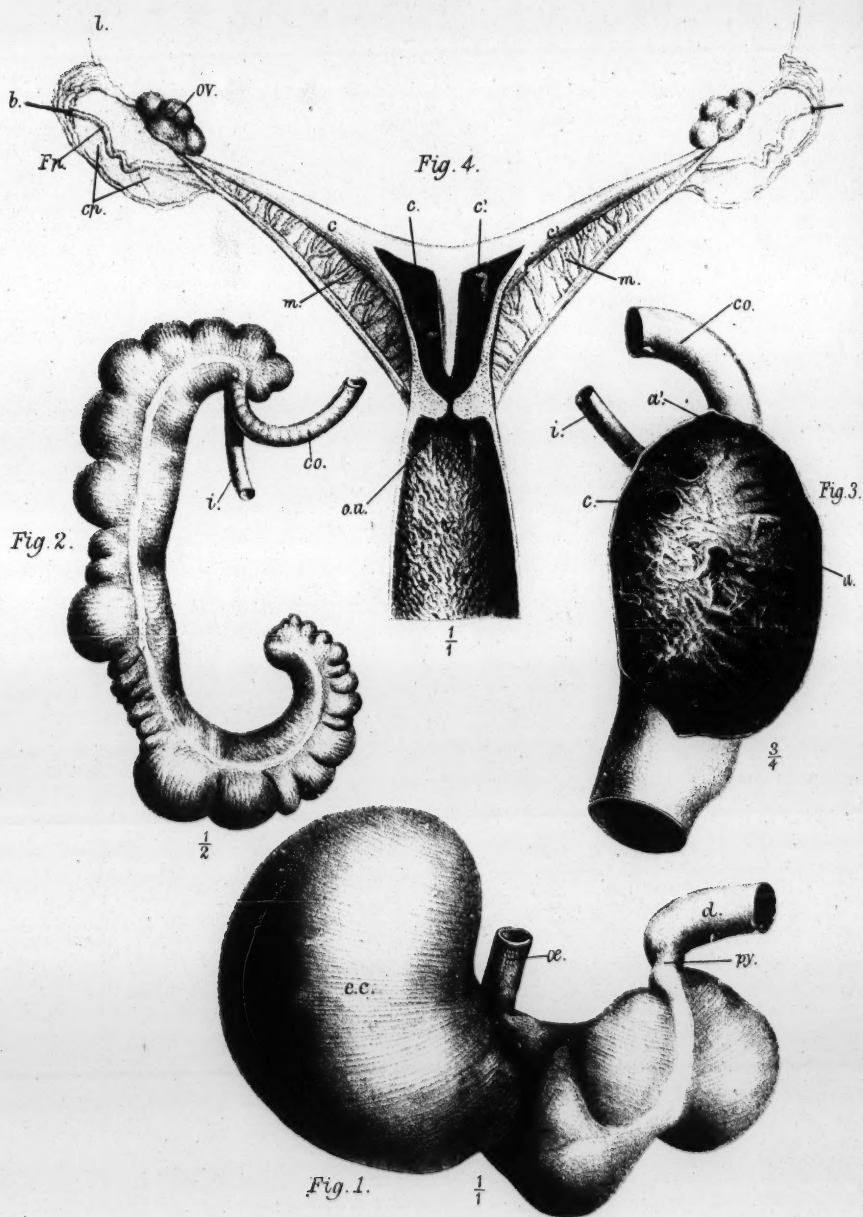


Fig. 2a







J. Smit lith.

Hanhart imp.

ANATOMY OF CAPROMYS.

6. On an apparently new Species of European Nuthatch.  
By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department  
of Zoology, British Museum.

[Received March 29, 1884.]

Mr. John Whitehead, who has been resident in Corsica for the greater part of the last two years, has very kindly presented to the British Museum a skin of a Nuthatch, shot by himself on the mountains of Corsica at a considerable elevation during an expedition in search of an Eagle's nest.

The Corsican Nuthatch, which I propose to call *Sitta whiteheadi* after its discoverer, is of about the same size as Krüper's Nuthatch (*Sitta krueperi*), and resembles it in the colour of the upper surface; but it is easily distinguished by the absence of the chestnut patch on the fore neck and vent and by the ashy isabelline colour of the underparts.

The head is rather damaged, and it is difficult to say how far the black of the forehead reaches, but it apparently extends to about the same distance as in *S. krueperi*, and not over the entire crown and nape as in *S. canadensis* and its allies. The diagnosis of the new species may, therefore, be given as follows:—

*SITTA WHITEHEADI*, sp. n.

*S. similis S. krueperi, capite eodem modo picturato sed gutture et pectore pallide cinerascentibus, subcaudalibus haud castaneo lavatis et præcipue plaga pectorali castanea nulla distinguenda.*  
*Long. tot.* 4·9, *culm.* 0·7, *alæ* 2·75, *caudæ* 1·5, *tarsi* 0·7.

*Hab.* Mountains of Corsica.

7. On the Myology and Visceral Anatomy of *Capromys melanurus*, with a Description of the Species. By G. E. DOBSON, M.A, F.R.S.

[Received April 1, 1884.]

(Plates XVIII.—XXI.)

The well-preserved specimens forming the material on which the following observations are based I owe to the kindness of Messrs. H. and F. W. Ramsden. They were obtained by the latter gentleman, H.M.'s Consul at St. Jago de Cuba, in the mountains in the southern extremity of that island, eight miles N.N.E. of Portillo.

So far as I can ascertain these appear to be the first specimens of this rare species of which the complete bodies preserved in alcohol have reached Europe; and I have therefore seized the opportunity thus afforded me of investigating the anatomy of an animal belonging to a genus so interesting as *Capromys*, which includes among its

species *C. pilorides*, remarkable for the extraordinarily subdivided condition of its hepatic lobes, first described by Say in 1822<sup>1</sup>.

The genus, which includes four species—*C. pilorides*, *C. brachyurus*, *C. prehensilis*, and *C. melanurus*—is also remarkable for its very limited geographical distribution, being confined, so far as we know, to the islands of Cuba and Jamaica, where its species appear to be the only indigenous representatives of the Order in these islands, as it is more than probable that the smaller Rodents<sup>2</sup> which now infest them were introduced. *C. brachyurus* appears to be limited to Jamaica, the other three species to Cuba.

As the original description of *C. melanurus* consists of a few lines only (see Monatsb. Akad. Berl. 1864, p. 384), I add the following notes on its specific characters, taken from the two well-preserved female specimens referred to above.

#### CAPROMYS MELANURUS (Poey), Peters. (Plate XVIII.)

Smaller than the common Rabbit, with a long, thick, cylindrical scaly tail clothed with long, rather coarse hairs, and with short, nearly naked ears, shorter than the muzzle and rounded off at the tips. The eyes are comparatively small; the muzzle rather narrow, terminated by the obliquely placed nostrils, which open sublaterally, while between them and running down to the upper lip is a shallow narrow groove becoming wider lower down. The hinder extremities are longer than the fore, but do not much exceed them in length, although the pes is very much larger than the manus; the latter is, nevertheless, large for the size of the animal; the palm is deeply concave, margined by five low rounded prominences covered by tuberculated skin; the pollex is quite rudimentary, protected by a small blunt claw; the other digits have prominent, convex, acutely pointed claws; the middle digit is longest, the fourth nearly equal to it, the second comes next in length, and the fifth is still shorter. The pes is more than double the size of the manus and nearly double its length; the hallux, though short, is not rudimentary and is provided with a claw like that of the other digits, which have the same relative lengths as the corresponding digits of the manus; all are provided with long, very strong, acutely pointed claws, much longer than those of the manus. The animal is plantigrade, applying the whole surface of both manus and pes to the ground. The plantar surface is concave behind the toes as in the manus, but there is no prominent posterior plantar callosity.

There are two mammary teats on each side, placed high up on the sides of the body, on a level with a line drawn from the lower margin of the scapula to the anterior crest of the ilium, as in *Myopotamus*. In the male animal (which the writer has not seen) the external generative organs probably resemble those of *C. pilorides* (described by Prof. Owen in P. Z. S. 1832, p. 76); in the female the orifices of the vagina and anus are placed on a conical prominence

<sup>1</sup> Journ. Acad. Nat. Sci. Philad. ii. p. 333 (1822).

<sup>2</sup> *Hesperomys palustris*, common in the Southern States of America, and the ordinary European Rats and Mice introduced by ships into the islands.

looking backwards and downwards, and open close together, that of the vagina by a transverse crescentic slit, in front of which the long prepuce of the clitoris projects.

The fur of the body is rather long and woolly, made up of two kinds of hairs—a basal close moderately fine fur, light brown, with the terminal thirds of the hairs pale yellowish, and longer black hairs, which, at intervals, project; on the tail the fur is made up altogether of these long black hairs (blackish-brown in alcohol), which arise thickly from between the regular whorls of scales which cover the integument and project from the caudal extremity, forming a pencil nearly an inch in length. The head is covered with fur similar to that of the body but shorter, and the sides of the muzzle support long black vibrissæ, some of which project backwards behind the head. The under surface of the head, neck, and body is slightly paler than the back.

The following measurements, in inches and millimetres, have been taken from an apparently adult female preserved in alcohol:—Length, head and body, measured along the back, 13" (329 mm.), ear 1" (25 mm.), eye from end of muzzle 1"·35 (34 mm.), tail 10"·5 (266 mm.), olecranon to end of middle digit (without claw) 3"·5 (88 mm.), manus to end of middle claw 1"·6 (41 mm.), pollex 0"·1 (4 mm.), middle toe (with claw) 0"·9 (23 mm.), tibia 2"·55 (65 mm.), pes to end of middle claw 2"·7 (68 mm.), middle toe (with claw) 1"·15 (30 mm.), hallux (with claw) 0"·6 (15 mm.).

The measurements of the skull, as compared with those of the other three species of the genus, is shown below, in millimetres.

#### Measurements of Skulls.

	<i>C. melanurus.</i>	<i>C. prehensilis.</i>	<i>C. brachyurus.</i>	<i>C. pilorides.</i>
From the occipital crest to the end of the nasal bones .....	75	75	82	101
From the margin of the foramen magnum to the edge of the alveoli of the upper incisors .....	57	...	63½	81
Length of the nasal bones .....	24	...	29	36
Length of the frontal bones .....	25	...	27	35
Length of the parietal bones .....	26	27	28	...
Length of the upper tooth-row (grinders) .....	15½	18	19	21
Length of the lower tooth-row (grinders) .....	16	...	20	21
Width between inner edges of upper premolars .....	4	4	4	5
Width between inner edges of upper posterior molars .....	6	9	8½	10

The measurements of the skulls of *C. pilorides* and *C. brachyurus*, as given above, were taken from those of evidently old animals, probably males, as shown by the development of the sagittal and occipital crests, the anchylosed condition of the suture between the

basioccipital and basisphenoid bones, and between the parietals. Those of *C. prehensilis* and *C. melanurus*, though apparently adult, do not show the sagittal crest, as above noted, and their surfaces are altogether smoother; this may be due to sex, for the skull of *C. melanurus* is that of a female, and that of the other species may also belong to the same sex. The skulls of *C. prehensilis* and *C. brachyurus* are in the British-Museum collection, that of *C. pilorides* in the Hunterian Museum, while that of *C. melanurus* belongs to the specimen of which the measurements of the body are given above.

## I. MYOLOGY.

### *Muscles of the Head and Neck.*

*Sterno-faciales* (fig. 1, *st.f.*).—On reflecting the integument

Fig. 1.



Dissection (half natural size) of the pectoral and cervical muscles described in the text.

*a.* Acromion; *c.* Clavicle; *c.p.* Coronoid process; *e.a.m.* External auditory meatus; *e.j.v.* External jugular vein; *m-m'* Masseter; *s.g.* Submaxillary gland.

covering the under surface of the neck and thorax these large muscles come into view. They arise together from the centre line

of the sternum almost as far back as its middle third, and, united by their contiguous internal margins, pass forwards, overlying part of the origius of the great pectoral muscles, and, concealing the sternomastoid and other muscles arising from the extremity of the sternum, are inserted into the rami and angles of the mandible.

These muscles are much more developed than usual in Rodents, resembling rather the corresponding structures in certain species of Insectivores, as in the Hedgehogs, in *Gymnura rafflesii*, &c.; in *Cercolabes prehensilis*, *Hystrix cristata*, *Erethizon dorsatus*, *Octodon cumingii*, and other species of hystricine Rodents examined by the writer they were found slender, scarcely exceeding the *sterno-mastoid* in lateral width.

*Sterno-maxillaris* is not represented. *Sterno-hyoid* (fig. 1, *st.h*) and *sterno-thyroid* muscles present no peculiarities.

*Sterno-mastoid* (fig. 1, *st.m*).—Arises from the extremity of the sternum and from the sterno-clavicular articulation, under cover of the preceding muscle, and is inserted with the *cleido-mastoid* into the mastoid process.

*Cleido-mastoid* (fig. 1, *cl.m*).—Arises from the commencement of the middle third of the clavicle, and is inserted into the mastoid process with and behind the preceding muscle.

*Cleido-occipitalis* is united with the *trapezius* (see further on).

*Digastric*.—These muscles are quite separate; each arises from the large styloid process of the temporal bone, and is inserted into the commencement of the short horizontal ramus of the mandible in front of the union of the coronoid process. There is no trace of tendinous intersection, but the surface of the muscle towards its anterior half is tendinous.

*Omo-hyoid* (fig. 1, *o.h*) is thin, without tendinous intersection; it has the usual origin and insertion.

*Levator claviculæ* and *levator scapulæ* (fig 1, *l.c.* & *l.s.*).—Arise together from the basis cranii but soon separate, the former becoming attached to the outer third of the clavicle, the latter to the acromion, both overlying the attachments of the united *trapezius* and *cleido-occipital* muscles.

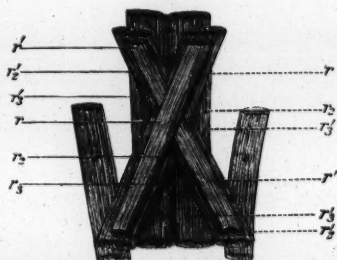
*Subclavius* (fig. 1, *s.c*) is well developed, arising from the cartilage of the first rib and costo-sternal articulation, and is inserted into the outer third of the clavicle.

*Scapulo-clavicularis*.—This muscle, first described by Cuvier and Laurillard in *Bathyergus maritimus*, and subsequently by Wood in *Cavia apereæ* and in *Mus decumanus*, is well developed. It consists of a broad flat muscular aponeurosis, which extends from the outer two thirds of the upper margin of the clavicle (where it appears to be continuous internally with the origin of the *cleido-mastoid*), to the anterior margin of the spine of the scapula and vertebral margin of the pre-scapula, lying on the *supra-spinatus* and *omo-hyoid* muscles, and covered superficially by the united *trapezius* and *cleido-occipital*.

*Rectus abdominis et sternalis* (fig. 2, *r-r'*).—Each muscle arises from the transverse process of the manubrium sterni, and, passing

backwards, divides near its insertion into three slips, of which the two superficial ( $r$ ,  $r_2-r'$ ,  $r'_2$ ) interdigitate with those of the muscles of the opposite side, and are inserted into the symphysis pubis on the side opposite to those from which the muscle is derived; the third slip ( $r_3-r'_3$ ) passes directly to its insertion into the corresponding side of the symphysis pubis, close to its fellow of the opposite side. The arrangement of the interlacing slips is as follows:—The most superficial slip ( $r$ ) is derived from the left rectus; this crosses a slip ( $r'$ ) from the superficial surface of the right rectus and is inserted into the right side of the symphysis pubis, while the latter ( $r'$ ) passes to the left side; the next slip is the second ( $r_2$ ) from the

Fig. 2.



Semi-diagrammatic, showing the relative portions of the intersecting slips of the right and left *recti abdominis* and of the *obliqui externi* muscles near their attachments to the pubic bones.

left rectus, proceeding to its insertion into the right side of the symphysis under cover of the first slip ( $r$ ), while the deepest of the interdigitating slips is the second ( $r'_2$ ) from the right rectus, which passes to its insertion into the left side of the symphysis under cover of the first from the same muscle.

*Obliquus externus, obliquus internus, transversalis*.—These muscles present no peculiarities. No blending together of the *obliqui externi* with the *recti*, as described by Prof. Owen in *C. pilorides* (P. Z. S. 1832, p. 74) was found in this species; the internal fibres ( $o$ ) of the first-named muscles are inserted into the symphysis pubis, under cover of and slightly external to those of the deep interdigitating slips of the *recti*, as shown in figure 2.

#### *Muscles of the Back, Thorax, and Abdomen.*

*Trapezius anticus* (fig. 1, *t.a*) arises from the inner third of the occipital crest, from the centre line of the neck, and from three or four dorsal spines, and is inserted along the spine of the scapula to the end of the acromion, and into the outer third or more of the

clavicle as far as the origin of the *cleido-mastoid*, under cover of the *levator claviculæ*.

The clavicular part of this muscle evidently corresponds to the *cleido-occipital* which is united with it.

*Trapezius posticus* has a very extensive origin, arising as far forwards as the posterior origin of the *tr. anticus* (with which it may almost be said to be continuous), and extending to the commencement of the lumbar aponeurosis, quite covering the anterior half of the *latissimus dorsi*.

*Rhomboideus anticus* and *rh. posticus* are represented by a single muscle arising from the inner third of the occipital crest and from the centre line of the neck, to the first and second dorsal spines. The anterior half of the muscle is very thin, the posterior much thicker; all the fibres are inserted into the internal and postero-internal border of the scapula.

*Serratus magnus* is overlapped by the posterior margin of the *levator angulæ scapulæ*. It arises from the cartilages of the first to the sixth ribs and is inserted as usual.

*Levator angulæ scapulæ* arises from the transverse processes of the third to the seventh cervical vertebræ, and is closely connected throughout its origin with the *scalenus medius*.

*Scalenus anticus* absent, as shown by the position of the brachial plexus. *Sc. medius* (fig. 1, *sc.m*) and *sc. posticus* appear to be united; they are inserted into the cartilages of the fourth to the sixth ribs.

#### *Muscles of the Fore Limb.*

*Pectoralis major* (fig. 1, *p-p'''*) arises in four parts—three *sternal* from the whole length of the sternum and aponeurosis of the external oblique, and one *clavicular*. Of the *sternal* the anterior (*p'*) arises from the anterior extremity of the manubrium sterni and as far back as the middle of the sternum under cover of the origin of the *sterno-facialis*, and, uniting with the clavicular part, is inserted with it into the middle of the shaft of the humerus along with the deltoid; the middle part arises behind the preceding as a strap-shaped muscle (*p''*), which is inserted under cover of it into the shaft of the humerus and into the internal tuberosity; and the posterior (*p'''*), broader, from the last bone of the sternum and from the aponeurosis of the external oblique muscle, is inserted under cover of the middle part into the internal tuberosity higher up. The *clavicular* part arises from the outer third of the clavicle, becomes connected with the anterior division of the *sternal* part below, and, above, with the lower margin of the *deltoid*, and is inserted as above described.

*Pectoralis minor* (fig. 1, *p<sup>1</sup>*).—This is represented by a completely separate strap-shaped muscle arising from the cartilages of the third to the sixth ribs, and inserted into the outer third of the clavicle and acromion under cover of the origin of the *clavicular* part of the *pectoralis major*. This is precisely as we find it in *Dasyprocta cristata*.

*Deltoid* arises from the acromion process (being connected by its

inner border with the clavicular part of the *pectoralis major*), and from nearly the whole outer border of the spine of the scapula; the fibres converging are inserted into the deltoid ridge of the humerus along with those of the clavicular part of the *pectoralis major*.

*Latissimus dorsi* (fig. 1, *l.d.*), arising from several dorsal and lumbar vertebræ, divides behind the brachial vessels and nerves into two parts: one unites with the *teres major* muscle and, passing above the brachial nerves, is inserted with it into the humerus; the other, a much smaller slip (*l.d.*), passes below the brachial nerves and is inserted by a broad fascial aponeurosis into the humerus under cover of the middle sternal part of the *pectoralis major*.

The vessels and nerves of the arm, therefore, pass out between the insertions of this muscle, as Meckel<sup>1</sup> noticed in *Hyrax*.

*Dorso-epitrochlearis* is well developed, arising from the external surface of the *latissimus dorsi*, immediately before the tendon of the latter is formed.

*Biceps* has two heads—a long one from the upper margin of the glenoid cavity, from which the main body of the muscle is derived, and a much smaller which arises by a tendon (common to it and the *coraco-brachialis*) from the coracoid process of the scapula. These two heads, uniting about the middle of the humerus, form a large muscular mass which is inserted by a strong tendon into the ulna, and by a narrow tendinous slip (which passes across the tendon of the *brachialis anticus*) into the adjacent margin of the radius.

*Coraco-brachialis* arises, as above described, with the short head of the *biceps* from the coracoid process, and by a tendon common to both, from which it separates at the lower margin of the tendon of the *subscapularis* muscle, and, forming a small muscular mass, is inserted into the lower third of the shaft of the humerus.

*Brachialis anticus* arises, as usual, below the external tuberosity, and, winding round the humerus, forms a broad tendon which, passing between the two divisions of the tendon of the *biceps*, is inserted into the ulna.

*Palmaris longus* and *flexor carpi ulnaris* arise together from the internal condyle and are inserted as usual.

*Flexor digitorum sublimis*, which arises as usual, forms the three perforated tendons for the three middle toes; that for the outer toe is formed by the *palmaris brevis*. These tendons in passing into the manus are covered by fascial arches, from which some of the fibres of the large lumbricales arising from the tendons of the *flexor profundus* also have their origin.

*Flexor digitorum profundus* exhibits no peculiarity in its origin; it is formed by a superficial, an internal, and two deep heads, which unite before crossing the carpus to form a very thick tendon, which gives off in the palm a slender filiform tendon to the rudimentary pollex, and four strong tendons to the four outer toes.

*Pronator radii teres*, *flexor carpi ulnaris*, and *flexor carpi radialis* present no peculiarities.

<sup>1</sup> 'Traité Général d'Anatomie Comparée,' vi. p. 263.

*Supinator longus* is absent, but *s. brevis* is moderately well developed.

*Palmaris brevis* is well developed, arising from the ulnar side of the sesamoid ossicle covering the carpo-metacarpal articulation of the pollex; the fibres cross the palm obliquely, superficial to the tendons of the *flexor sublimis*, and end by forming the perforated tendon for the fifth digit.

*Lumbricales* are remarkably large; they are four in number, and arise close together (separated only by the tendons of the *flexor digitorum sublimis*) from the palmar surface of the tendon of the *flexor profundus*, immediately before it divides into slips for the five digits, and from the fascial arches under which that tendon passes into the hand. The first *lumbricalis* goes to the radial side of the palmar surface of the second digit, and the other three are similarly distributed to the third, fourth, and fifth digits respectively.

*Abductor minimi digiti* arises from the pisiform bone, and forms a slender tendon which is inserted into the ulnar side of the meta-carpo-phalangeal sesamoid bone of the fifth digit.

*Flexor brevis minimi digiti* arises, under cover of the preceding, from the pisiform bone, and forms a tendon which unites with that of the outermost of the pair of *flexores breves* for the fifth digit, and is, with it, inserted into the sesamoid bone.

Although the pollex is very small, it is well supplied with muscles; there is a *flexor brevis*, an *adductor*, and a pair of *flexores breves*. The *flexor brevis* arises from the sesamoid bone, covering the pollical carpo-metacarpal articulation, and forms a slender tendon which is inserted into the radial side of the inferior surface of the base of the terminal phalanx. The *adductor pollicis* arises from the ligamentous structures at the base of the second metacarpal bone, and is inserted into the first phalanx of the pollex; and the pair of *flexores breves* arise partly from the base of the first metacarpal and partly from the sesamoid bone above-named.

*Adductor indicis* and *adductor minimi digiti* are well developed; they arise together from the ligamentous structures at the bases of the third and fourth digits, and, continuing united for some distance, diverge to their insertions into the bases of the first phalanges of the second and fifth digits, respectively.

*Flexores breves*.—There are a pair of these muscles for each digit, arising as usual. (For insertions see *interossei dorsales*, below.)

*Extensor communis digitorum* and *extensor minimi digiti* arise together, as usual, from the external condyle; and the *extensor secundi internodii pollicis et extensor indicis* from the ulna and interosseous membrane. The first-named divides into four tendons for the four outer digits; the second forms one for the fifth digit and another for the fourth, which unites with the dorsal interosseous for that digit, and is, with it, inserted into the base of the dorsal surface of the second phalanx of that digit; the last-named, the *extensor secundi internodii pollicis et extensor indicis*, divides into two slips—one, very slender, goes to the terminal phalanx of the pollex, the other to the corresponding phalanx of the second digit.

scles are fused with the palmar  
hout their muscular extent. Of  
a of the three middle digits, each  
ards and dorsalwards alongside  
n of its fellow passing along the  
ase of the second phalanx of the  
d, crossed by the tendon of the  
nal phalanx. Thus each of the  
has a pair of dorsal as well as of  
fifth digit, however, has but a  
small pollex appears to have none.

### Hind Limbs.

thin, arising from the anterior  
n the spinous processes of the  
d is inserted into the fascia lata  
external third of the shaft of the

It arises from the spines of the  
der cover of the *gluteus maximus*  
uper surface of the ilium, including  
small *gluteus minimus*; the fibres  
uick tendons into the upper and  
er.

(above described) is a narrow long  
inner part of the anterior half of  
along with the *gl. medius*, forms a  
ater trochanter between the two

us are both absent.

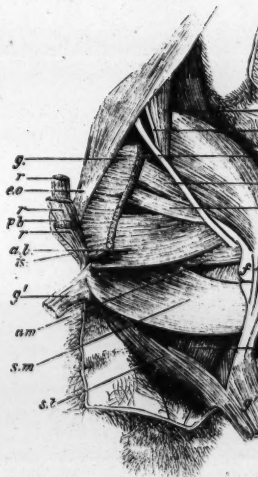
cover of the *adductor magnus*  
ed into the outer side of the lesser

forming a broad flat muscle arising  
chium from the acetabulum to the  
greater trochanter under cover of

o heads, a superficial and a deep :  
ocesses of the last two coccygeal  
ls under cover of the ilio-caudal  
c nerve, and are inserted into the  
ascia covering the knee-joint; the  
hii in connexion with the *adductor*  
spreading out into a fan-shaped  
ion with the tendinous aponeurosis  
nd of the fibula, and, lower down,  
eal muscles and into the *tendo-*

*Gracilis* (fig. 3, *g*) closely resembles th  
in *Erethizon dorsatus*<sup>1</sup>. As in that species  
parts :—the *upper*, from the ilio-pectineal ri  
divides at a short distance from its origin into  
near their insertion by their flat tendon an  
tendon of the *quadriceps extensor cruris*, into  
patella, and into the head and tuberosity of the  
is narrower, but thicker, arising from the sy  
the ramus of the pubis and ischium as far as  
*membranosus* muscle, and is inserted into the  
and slightly overlapping the insertion of th

Fig. 3.



Dissection, half natural size, of the muscles on th  
and leg described in the  
a.c. Anterior crural nerve; f. Internal condyle of  
i.l.l. Internal lateral ligament; is. Ra  
pb. Symphysis pubis.

connected by a tendinous aponeurosis wi  
upper part.

*Adductor longus* (fig. 3, *a. l.*) is small,  
margin of the pelvis under cover of the n  
part of the *gracilis* at its origin, and, pa  
and partially covered by the *pectineus*, is  
the femur directly under the insertion of th

<sup>1</sup> See Mivart, "Anatomy of *Erethizon dorsatus*."

ables the corresponding muscle  
species it arises in two distinct  
ineal ridge and symphysis pubis,  
igin into two parts; these unite  
ndon and are inserted into the  
uris, into the internal edge of the  
ty of the tibia; the *lower* part (*g'*)  
n the symphysis pubis and from  
as far as the edge of the *semi*-  
into the shaft of the tibia above  
on of the *semitendinosus*, being

3.



cles on the anterior aspect of the thigh  
ed in the text.

ondyle of femur; f.a. Femoral artery;  
; is. Ramus of pubis and ischium;

arosis with the lower edge of the

is small, arising from the bony  
of the middle third of the upper  
and, passing forwards parallel to  
*ineus*, is inserted into the shaft of  
tion of that muscle.

ron dorsatus," P. Z. S. 1882, p. 284.

*Adductor brevis* (fig. 3, *a. b*) is very large, arising from the *symphysis pubis* and ramus of the pubis and ischium as far as the tuber ischii; it forms a thick and broad muscular mass inserted along nearly the whole length of the shaft of the femur in its middle third under cover of the insertion of the *adductor longus*, and in its lower third extending to the insertion of the *adductor magnus*.

*Adductor magnus* (fig. 3, *a. m*), long and narrow, arises from the tuber ischii under cover of and in connexion with the deep head of the *biceps flexor cruris*, and passes forwards, separated from this muscle by the great sciatic nerve, to its insertion into the femur immediately above the point of origin of the internal head of the *gastrocnemius*, with which it is slightly connected.

*Adductor quartus* is large, covering the *obturator externus*; it arises from the lower and part of the posterior and anterior margins of the *obturator foramen* under cover of the *adductor brevis* and *adductor longus*, and is inserted into the shaft of the femur immediately below the lesser trochanter and between it and the insertion of the *adductor brevis*.

*Pectineus* (fig. 3, *p*) arises above the *adductor longus* from the margin of the pelvis below and behind the acetabulum, and is inserted into the middle third of the shaft of the femur, in front of the *adductor longus*.

*Semi-membranosus* (fig. 3, *s.m*) arises from the ramus of the pubis and the ischium, behind the *adductor brevis*, and is inserted behind the internal lateral ligament.

*Semi-tendinosus* (fig. 3, *s.t*) arises by two heads—one small, from the tuber ischii immediately above the *semimembranosus*, and in connexion with the *biceps flexor cruris*; the other from the last coccygeal vertebrae and the side of the base of the tail; the anterior part of the latter unites with the posterior margin of the deep head of the *biceps flexor cruris*, the posterior part with the deep head described above arising from the tuber ischii, and is inserted below the *gracilis* into the shaft of the tibia.

*Psoas parvus* is small, arising from the first to the fourth lumbar vertebrae, and inserted tendinously into the margin of the pelvis.

*Psoas magnus*, much larger, arises further backwards from the bodies of the third to the last lumbar vertebra, close to its fellow of the opposite side; unites with the *iliacus*, and is, with it, inserted into the lesser trochanter.

*Obturator externus* arises under cover of the *adductor quartus* from the margin of the obturator foramen and from the obturator ligament, and, forming a thick muscular tendon, is inserted into the neck of the femur.

*Extensor digitorum longus* arises by a tendon from the external condyle of the femur, and, passing down under cover of the *tibialis anticus*, enters the foot, and is distributed to the four outer toes.

*Tibialis anticus* is very large, arising from the head of the tibia, from the upper half of that bone, and from the interosseous ligament; it forms a thick tendon which curves round the side of the foot, and, passing under cover of the *abductor ossis metatarsi hallucis*, is inserted

obliquely into the distal third of the plantar surface of the first metatarsal bone on its inner side.

*Extensor hallucis longus* is well developed, arising from the middle third of the shaft of the fibula and from part of the interosseous membrane, and is inserted into the terminal phalanx of the hallux.

*Peroneus longus, brevis, quartus, quinti digiti*.—All these muscles are well developed, the *p. longus* arising as usual most superficially from the head of the fibula, the *p. brevis* under it by an extensive origin external to the lower third of the fibula, while, under cover of it and external to it, the *p. quartus* and *p. quinti digiti*; all the tendons pass behind the malleolus and are inserted as usual.

*Extensor digitorum brevis* is small, arising from the os calcis on the fibular side of the astragalus; divides into two tendons, of which the inner unites with the long extensor tendon of the second toe; the outer is inserted into the base of the second phalanx of the third toe.

This muscle should, evidently, be considered a pedal part of the same mass from which the *peroneus quartus* and *peroneus quinti digiti* tendons are derived.

*Gastrocnemius* is very large, having the usual origin and insertion.

*Plantaris* arises from the external condyle in close union for some distance with the *gastrocnemius*: its tendon passes over the os calcis and enters the foot, where it becomes continuous with the plantar fascia and gives part origin to the *flexor digitorum brevis*.

*Soleus* has a fibular head only, arising from the head of the fibula.

*Flexor digitorum tibialis* arises from the head of the fibula under cover of the *popliteus*, and between the internal margin of that muscle and the origin of the *tibialis posticus*, and from the shaft of the tibia, under cover of the *popliteus*, as far down as the commencement of its lower third; forms a strong tendon which passes through a groove on the internal malleolus, on the fibular side of the *tibialis posticus* tendon, and, entering the foot, unites with the tibial side and superficial surface of the *flexor fibularis*, forming the tendon for the hallux and contributing to that for the fifth toe.

*Tibialis posticus*.—Smaller than the preceding, between which and the *flexor fibularis* it arises from the head of the fibula and along the upper half of the shaft of the tibia; forms a moderately large tendon, which, passing across the internal malleolus on the tibial side of the tendon of the *flexor tibialis*, is inserted into the scaphoid bone.

*Flexor digitorum fibularis* is of great size, arising from nearly the whole fibula, from the interosseous membrane, and from the middle third of the shaft of the tibia; forms a strong tendon which unites with that of the *flexor tibialis*, as described above<sup>1</sup>, and is distributed mainly to the three middle toes.

*Flexor digitorum brevis* is very large, arising in two masses, a superficial and a deep: the former arises from the *plantaris* and

<sup>1</sup> The relations and connexions of the above-described three muscles conform in all respects to the Hystricine type, as explained in the writer's paper, "On the Homologies of the Long Flexor Muscles of the Feet of Mammalia, with Remarks on the Value of their leading Modifications in Classification," Journ. Anat. & Phys. xvii. p. 142.

plantar fascia, from the os calcis, and from a flat sesamoid bone connected by ligament with the scaphoid and lying on the scapho-cuneiform articulation, and forms three muscular masses ending in three tendons, which, joined by muscular fibres from the deep part (which arises from the superficial surface of the united tendons of the *flexor digitorum fibularis* and *flexor digitorum tibialis*), form the perforated tendons for the three middle toes, the perforated tendon for the fifth toe being derived altogether from the muscular fibres arising from the long flexor tendons.

*Flexor accessorius pedis* is well developed, arising from the os calcis; forms a broad flat muscle, which is inserted into the tibial margin of the tendon of the *flexor tibialis* from a point above its union with the tendon of the *flexor digitorum fibularis* to where the tendon for the hallux is given off.

*Lumbricales*.—There are four well-developed *lumbricales*: the first arises from the fibular side of the hallucaeal tendon and is inserted into the tibial side of the first phalanx of the second toe near its base; the second arises from the tibial side of the tendon for the third digit, and is inserted similarly into the same digit; the third, from both the third and fourth tendons, is inserted similarly into the fourth toe; and the fourth, from the fibular side of the fourth tendon, is inserted into the fifth toe.

*Abductor ossis metatarsi hallucis*.—This is a short muscle extending from the scaphoid bone and the flat sesamoid bone covering the scapho-cuneiform articulation to the tibial side of the base of the first metatarsal.

*Adductor hallucis, indicis, minimi digiti*.—Of these muscles the first-named arises from the deep plantar fascia and ligamentous structures at the base of the second metatarsal, and, passing forwards and inwards, is inserted into the fibular side of the sesamoid bone covering the metatarso-phalangeal joint of the hallux. The *adductor indicis* and *add. minimi digiti* arise together from the ligamentous structures at the bases of the third and fourth metatarsal bones, and, continuing united as far as the middle of the third metatarsal, diverge to their insertions into the fibular side of the sesamoid bone at the base of the second toe, and into the tibial side of that at the base of the fifth toe respectively.

*Flexores digitorum breves vel interossei*.—There are, as usual, a pair of very distinct *flexores breves* for each toe, arising from the sides and bases of the metatarsal bones; of those for the hallux that on the tibial side is much larger and longer, arising as far back as the sesamoid bone and ligamentous structures covering the scapho-cuneiform articulation.

*Interossei dorsales*.—There are two representatives of these muscles, namely for the third and fourth toes; each is fused throughout its muscular part with the plantar interosseous muscle on the tibial side of its metatarsal bone, but forms a distinct tendon which passes forwards between the toes, and, turning upwards, unites over the second phalanx with the conjoined tendon of the *extensor communis* and *extensor brevis digitorum* muscles.

## II. VISCERAL ANATOMY.

The *tongue* is moderately long, laterally compressed, and obtusely pointed; its surface is covered with conical papillæ, among which no fungiform papillæ appear, nor are there any circumvallate papillæ at the base.

The *œsophagus* is narrow, with very muscular walls, and extends about one inch beyond the diaphragm.

The *stomach* (Plate XXI. fig. 1) is more complicated than in *C. pilorides*. Between the cardia and the pylorus there are two distinct constrictions which partially divide the cavity into three compartments: in the first of these, or cardiac cul-de-sac, the mucous lining on the ventral side is thrown into prominent long parallel ridges; in the second and third compartments the mucous membrane is smooth and thick. In *C. pilorides* the stomach is divided by a single constriction only, cutting off a pyloric part from the general cavity; in that species also the duodenum is much dilated near the pylorus, much more so than in *C. melanurus*.

The *intestinal canal* of *C. melanurus* so closely resembles that of *C. pilorides*, that Prof. Owen's description (*l. c.*) of that of the latter species will equally apply to it, the measurements only, as might be expected from the smaller size of this species, being slightly less: thus the ilium measures  $7\frac{1}{2}$  feet, the colon  $4\frac{1}{2}$  feet, and the cæcum 1 foot. The ileo-cæcal valve (Plate XXI. fig. 3, c) is, as described by Prof. Owen, formed by the expanded orifice of the ileum being applied, as it were, to the side of the cæcum over a much smaller orifice in that gut, the parietes of the cæcum so included forming a semilunar valve. On the side of the inner surface of the cæcum opposite the valve is placed a small patch of agminated glands (Plate XXI. fig. 3, a), and, above the entrance to the colon, a smaller patch (a'). In *C. pilorides* these patches are similarly placed, and are about the same size.

The *duodenum* is clothed with very fine long thread-like villi; at about two feet from the pylorus these are partially replaced by thick, conical, densely-set villi, which continue for about 8 inches, and, for  $4\frac{1}{2}$  feet, the intestine is again clothed with thread-like villi, which, in the lower half, become very short and thinly set; then, for  $2\frac{1}{2}$  inches only, thick, conical, densely-set villi reappear and entirely replace them, and finally, for the last 16 inches, the former again appear and extend to the ileo-cæcal valve.

The first Peyerian patch occurs in the duodenum about 4 inches from the pylorus, and from this to within 18 inches of the cæcum thirty-three patches are found at varying intervals; in the last 18 inches there is but one. Near the distal extremity of the large cæcum there is a large Peyerian patch, including about 30 follicles, situated partly on the longitudinal band which traverses the gut, and opposite it a smaller one; from this to the colon there are ten others, similarly placed, most of them small, the largest being those referred to above. In the colon are five patches, one in the first sacculus, and four between this and the middle of the gut, consisting each of four to five follicles.

The *liver* (Plates XIX. and XX. figs. 1, 1 a) differs from that of *C. pilorides* (Plates XIX. and XX. figs. 2, 2 a) chiefly in the absence of that subdivision of the lobes into lobelets, as originally described by Say and subsequently by Owen in that species, and as shown in the figures above referred to. The primary division of the liver of *C. pilorides* into lobes is, however, on precisely the same plan as in *C. melanurus*, as may be seen by comparing the figures, the principal difference in the general outline being noticeable in the right and left central lobes, which in *C. melanurus* scarcely exceed the right and left lateral lobes in length, but in *C. pilorides* are greatly produced backward. In both species the Spigelian lobe (\*) is small and similarly shaped, and in both there is a similar separated portion (ll') of the left lateral lobe (ll). The *gall-bladder* is well-developed<sup>1</sup>. The other abdominal viscera are as in *C. pilorides*.

The *epiglottis* is short, and rounded at the tip. The *vocal cords* are shallow, but very dense in structure, with sharply defined margins, as in *C. pilorides*, but there are no distinct *sacculi laryngis*. With this exception Prof. Owen's description of the larynx of *C. pilorides* also applies to this species. The *trachea* is formed of twenty-eight cartilaginous rings, dorsally imperfect; the *bronchi* diverge gradually, and the right bronchus much exceeds the left in calibre. The *lungs* are divided into lobes precisely as in *C. pilorides*.

The *heart* is rounded at the apex, without trace of a notch between the ventricles. As in *C. pilorides* and *Erethizon dorsatus*<sup>2</sup>, there is a large innominate artery which gives off the right subclavian and the two common carotid arteries, the left subclavian arising separately from the arch of the aorta. The arrangement of the *precaval veins* differs, however, remarkably from that of *C. pilorides* as described by Prof. Owen, for instead of the blood returned from the head and anterior extremities being emptied into the right auricle by a single vein, there are, as in most species of Rodentia and Insectivora, two precaval veins; the left precaval vein receives the left vena azygos and winds round the heart to open into the right auricle, while between the orifices of the right and left precavals the *postcaval vein* enters.

The male generative organs cannot be described for want of material, but they probably resemble those of *C. pilorides* described by Prof. Owen (*l. c.*).

The *clitoris* is provided with a long prepuce, and is perforated by the urethra; the *vagina* is remarkably long and spacious, and its walls are marked by numerous rugosities. The *uterus* (Plate XXI. fig. 4) is bicornuate; the long cornua unite by their internal margins in their posterior thirds, but their cavities continue separate almost to the vagina, into which, however, they open by a single os. The *ovaries*, as in the Hare, are not enclosed in peritoneal capsules, each capsule is quite open, and the Fallopian tube, after pursuing a tortuous

So differing from *Erethizon* and *Cercolabes*, where there is no trace of one. It must, however, be remembered that there is a gall-bladder in the closely allied *Hystrix*.

<sup>2</sup> Mivart, P. Z. S. 1882, p. 279.

course, opens on its external free margin at the furthest distance from the ovary; each ovary lies close behind and external to the kidney, external to which the ovarian ligament passes outwards, downwards, and forwards upon the ribs and intercostal spaces, becoming lost in the peritoneal lining.

The *brachial plexus* is formed from the fifth, sixth, seventh, and eighth cervical, and from the first dorsal nerve, as shown in the diagram (fig. 4). Superficial branches from the seventh and eighth

Fig. 4.

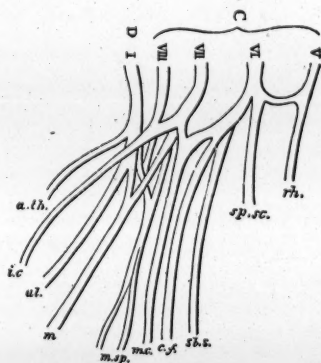


Fig. 5.

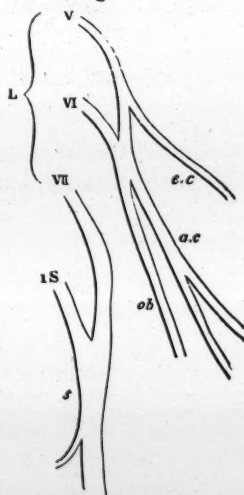


Fig. 4. Origins and connexions of the nerves of the brachial plexus.

Fig. 5. Origins and connexions of the nerves of the lumbar plexus.

a.c., Anterior crural; a.th., Anterior thoracic; c.f., Circumflex; e.c., External cutaneous; i.c., Internal cutaneous; m., Median; m.sp., Musculo-spiral; ob., Obturator; rh., Rhomboid; s., Great sciatic; sb.s., Subscapular; sp.sc., Suprascapular.

nerves unite to form the *internal cutaneous nerve* (i.c), which is distributed as usual; and superficial branches derived from the sixth and seventh nerves unite to form the *musculo-cutaneous* (m.c). The *ulnar nerve* (ul) is formed by the junction of a large branch from the united branches of the first dorsal and eighth cervical nerves, and sends off a branch, which, with one derived from the seventh cervical, forms the *median nerve* (m). The *musculo-spiral* (m.sp), a large nerve, is formed under cover of the origin of the preceding nerves from branches from the seventh and eighth cervical nerves, and a small twig from the first dorsal. The *circumflex* (c.f) is formed altogether from the sixth cervical, with which a communicating filament is derived from the fifth nerve.

The *lumbar plexus* (fig. 5) is remarkably simple, even more so than in *Erethizon dorsatus*<sup>1</sup>; it is formed from the last three lumbar (the fifth, sixth, and seventh lumbar nerves) and the first sacral; as in *E. dorsatus* there is no connexion between the nerve from which the crural and obturator nerves are derived and the anterior root of the great sciatic; the *anterior crural nerve* (*a.c*) is formed by the junction of the fifth and sixth lumbar nerves, from which also the *obturator nerve* (*ob*) is given off; the *great sciatic* (*s*) is formed by the last (the seventh) lumbar nerve and the first sacral only. In the distribution of the nerves of this plexus no peculiarities are noticeable.

To sum up, *C. melanurus*, while differing so remarkably from *C. pilorides* in the absence of that subdivision of the hepatic lobes which has been described in the latter species<sup>2</sup>, and in the presence of two pre-caval veins, resembles it closely in other respects in its visceral anatomy, and probably also in its myology, as the few notes available on the myology of *C. pilorides* agree with the writer's observations on that of *C. melanurus*. In their general anatomy both species show the close relationship which exists between this genus of *Octodontidae* and the genera of *Hystriidae*, indicating the near affinities of these two families of Hystricine Rodents.

#### EXPLANATION OF PLATES.

##### PLATE XVIII.

*Capromys melanurus*, half natural size.

##### PLATES XIX. & XX.

Fig. 1, 1 a. Liver of *C. melanurus*, showing convex and concave surfaces.

2, 2 a. Liver of *C. pilorides*, showing corresponding surfaces. *c*, Caudate lobe; *g*, gall-bladder; *l*, suspensory ligament; *l.c*, left central lobe; *l.l-l.l'*, left lateral lobe; *r.c*, right central lobe; *r.l*, right lateral lobe; *s*, spigelian lobe.

##### PLATE XXI.

Fig. 1. Stomach of *C. melanurus* (natural size), dorsal surface. *c.c*, Cardiac cul-de-sac; *d*, duodenum; *a*, œsophagus; *py*, pylorus.

2. Cæcum, half natural size. *co*, colon; *i*, ileum.

3. Proximal part of cæcum (three fourths natural size) laid open, showing the ileo-cæcal valve (*c*), and the position of the two patches (*a*, *a'*) of agminated glands; *i*, ileum; *co*, colon.

4. Uterus and upper half of vagina, the latter (*v*), the os uteri (*o. u*), and part of the right and left cornua (*c*, *c'*) are laid open; on either side the mesometrium (*m*) with vessels, the ovaries (*ov*), the open peritoneal capsules (*cp*) each traversed by the Fallopian tube (*f.p*), and the ostium (indicated by a bristle, *b*) of the latter opening on the outer border of the peritoneal capsule, are shown.

<sup>1</sup> Mivart, P. Z. S. 1882, p. 281, fig. 9.

<sup>2</sup> It is therefore evident that the subdivided condition of the hepatic lobes into lobelets can no longer be considered characteristic of the genus *Capromys*.

May 6, 1884.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1884 :—

The total number of registered additions to the Society's Menagerie during the month of April was 220. Of these 43 were acquired by presentation, 61 by purchase, 7 were born in the Gardens, and 30 were received on deposit. The total number of departures during the same period, by death and removals, was 128.

The most noticeable additions during the month were :—

1. Two Nepalese Hornbills (*Aceros nepalensis*), purchased April 4th, being the first examples of this fine species of Hornbill that have been acquired by the Society.

2. A fine Gigantic Salamander of Japan (*Megalobatrachus maximus*), purchased April 23rd. No specimen of this Batrachian has been in the Society's collection for some time. The present example is about 2 feet 8 inches in length.

3. A series of animals collected by Charles T. Kettlewell, Esq., F.Z.S., during the voyage of the yacht 'Marchesa' in the Eastern Archipelago, amongst which were three examples of the Lesser Bird of Paradise (*Paradisaea minor*) from Jobie Island, and one of the White Cockatoo of the Philippines (*Cacatua philippinarum*), obtained at the Sooloo Islands—a new locality for this species.

4. A fine example of the Mediterranean Seal (*Monachus albi-venter*), an animal now growing scarce and difficult to procure, purchased April 26th.

5. A Banded Gymnogene (*Polyboroides typicus*), purchased April 30th. This is the first example of this very curious bird of prey that has been acquired for the collection.

---

Professor Bell exhibited some specimens of *Estheria melitensis* sent from Malta by Captain Becher, R.A., and stated that, in answer to his inquiries, that gentleman had confirmed the fact of the males appearing to equal in number the females, as had been stated by previous observers of the members of the genus.

---

Lieut.-Col. H. H. Godwin-Austen exhibited and made remarks on an old Indian drawing representing a Tiger-hunt, and called attention to the colour of one of the Elephants represented in it, which was of a creamy-white.

---

A communication was read from Mr. G. A. Boulenger, F.Z.S., containing an account of the Reptiles and Batrachians of the Solomon Islands. This memoir was based principally on two important collections made in the Solomon Islands and transmitted to the British Museum by Mr. H. B. Guppy of H.M.S. 'Lark' in 1883 and 1884, in which were found several new and interesting forms.

RUS CAPYBARA. [May 6,

itherto known to occur in  
and those of Batrachians

ety's 'Transactions.'

Capybara (*Hydrochaerus*  
LOWER, LL.D., F.R.S.,

4.]

mplicit Rodents have  
molars, the rule seems to  
three (as in the Common  
*omys*), these are all true  
e animals then are truly  
ceeds three, it is by the  
which are premolars and  
ge majority there is only

ole variation is observed in  
ey are matured and shed.  
one milk-molar (a small,  
bsorbed or shed a short  
es and Beavers the cor-  
al has nearly reached the

re born in the Society's  
ther lived until the 8th of  
eserved, and is now in the  
s. It shows the state of

is  $i. \frac{1}{1}, c. \frac{0}{0}, p. \frac{1}{1}, m. \frac{3}{3} = 20$ ;  
molars being inferred from  
other placental Mammals.  
anium of which measures  
teeth is just the same as  
olariform teeth being all  
ent. A small portion of  
r molar, has been already  
ne same form and pattern  
deep lateral grooves into  
full-grown tooth. They  
length of the whole series

of the Mammalia," by W. H.  
y of Great Britain, iii. 1871

1884.] PROF. F. J. BELL ON THE GENUS AMPHICYC

in the upper jaw being 30 millim. instead of 72 as  
They evidently represent the narrow apical portion of  
teeth, which as growth proceeds wears off, and they a  
case milk-teeth. As the first of the series, or premo  
developed as the one which follows it (or first true m  
either have no predecessor, or one which has disappea  
stage of intra-uterine life.

2. Studies in the Holothuroidea.—III. On A  
new Genus of Dendrochirotoous Holothuri  
bearing on the Classification of the Famil  
fessor F. JEFFREY BELL, M.A., Sec.R.M.S.

[Received March 28, 1884.]

Among the valuable collections made during 187  
H. C. St. John, H.M.S. 'Sylvia,' in the Japanese s  
Holothurians; these were not reported on along wi  
the Echinodermata, which some years ago formed  
interesting communications from Prof. Martin Dunca  
Mr. Sladen<sup>1</sup>.

Now that I am engaged in working through the  
Echinoderms in the British Museum, the Trustees of  
specimens now under consideration to the generosity  
Jeffreys, F.R.S., I think it proper to direct the at  
Society to two very remarkable specimens among these  
which cannot be placed in any genus at present ins  
lessons to be learned from these specimens, and the  
has been acquired of forms unknown to Professor S  
chiefly to the labours of Ludwig and v. Marenzeller  
to a reconsideration of the classificatory system an  
table which in 1868 was put out by Semper, to whom  
Holothurians will always be under the deepest obligati  
diffidence that I propose to rearrange a family that h  
by this distinguished naturalist.

*Description of the Specimens.*—Body elongated,  
hinder end. Oral tentacles in two cycles; in the ou  
fair size, and more or less subequal; in the inner t  
arranged regularly by pairs, radial in position. Such  
the ambulacra, arranged in quite regular rows; in th  
lacræ they are set in pairs, but are a little more irreg  
crowded in the trivial ambulacra. Owing to the att  
body in the hinder region, the rows of suckers approx  
The interradii are altogether free of suckers. There  
any calcareous pharyngeal plates.

<sup>1</sup> Journ. Linn. Soc. (Zool.), vol. xiv. pp. 424,  
PROC. ZOOL. SOC.—1884, No. XVIII.

of 72 as in the adult  
tion of the permanent  
d they are not in any  
r premolar, is as fully  
st true molar) it must  
disappeared at an early

On *Amphicyclus*, a  
holothurians, and its  
Family. By Pro-  
R.M.S.

ring 1876 by Captain  
apanese seas were a few  
along with the rest of  
formed the subject of  
n Duncan, F.R.S., and

ugh the collections of  
stees of which owe the  
generosity of Dr. Gwyn  
the attention of the  
ong these Holothurians  
esent instituted. The  
and the knowledge that  
fessor Semper, thanks  
renzeller, lead, I think,  
stem and phylogenetic  
to whom the student of  
obligations. It is with  
y that has been studied

ongated, tapering at its  
n the outer fourteen, of  
inner ten, very small,  
n. Suckers confined to  
ys; in the bivial ambu-  
ore irregular and more  
the attenuation of the  
s approach one another.  
There are no signs of

There are no calcareous plates or spicules developed in the walls of the body or of the tube-feet, the only calcareous deposits being the terminal plates of the tube-feet, and the delicate and elegant bars which are found in the tentacles<sup>1</sup>.

The integument is very thin anteriorly, but increases considerably in thickness in the hinder part of the body, where it is quite stout. When its walls were cut through, the anterior portion of the body-cavity was found to be filled with a large number of stout, rather short genital tubes, which branched only once or twice, but were so numerous as to obscure considerably the underlying parts. The retractors of the pharynx are inserted behind the middle point of the body; two of them are remarkable for approaching and uniting with one another; under the band thus formed, on one side the intestine passes twice. The intestine is very delicate. No Polian vesicle was detected, and it is probably of comparatively small size; the so-called water-lungs extend forwards to the anterior end of the body.

The characters presented by this form are sufficiently remarkable to justify the establishment of a new genus for its reception. It stands nearest to the two genera instituted by Ludwig—*Echinocucumis* and *Actinocucumis*; but it differs from them both in the important character of the regularly paired disposition of the radially placed smaller tentacles. With them, it differs from all other *polychirote* (or *Dendrochirotae* with more than ten tentacles), and agrees with the more simple of the *decachirota* *Dendrochirotae* in having the sucker-feet confined to the ambulacra.

In consequence of the definite disposition of the tentacles in two cycles, I propose to speak of it as *Amphicyclus*, this form of the name being sufficiently different from *Amphicyelia*<sup>2</sup>.

The *Generic Characters* appear to be:—Stichopod arrangement of the suckers associated with the possession of more than ten oral tentacles; the tentacles in two circles: those of the inner are arranged in pairs, are ten in number, radial in position, smaller than those of the outer circle, in which there are fourteen subequal tentacles. There are no calcareous pharyngeal plates, and two of the retractors of the pharynx are united with one another.

As there is only one species known, the discrimination of the specific characters is, of course, unsafe; but these appear to be:—(1) Complete absence of rods or spicules from the walls of the body or tube-feet; (2) attenuation of the hinder end; (3) thinness of integument of anterior end; (4) large number of genital tubes.

As the locality is known (lat. 41° 12' N., long. 140° 45' E.; 43 fms., sand and mud), I propose the specific name of *japonicus*.

The useful classification proposed by Professor Semper in his magnificent work has been universally adopted by systematists since the year 1868; in it the *Dendrochirotae* *Pneumophora* were

<sup>1</sup> In *Cucumaria frondosa*, where calcareous deposits are reduced to a minimum, there are well-developed plates in the tentacles; and *Thyone okeni* (see Brit. Mus. Cat. 'Alert' coll.) has rods in the tentacles only.

<sup>2</sup> Haeckel, *Jennische Zeitschr.* vol. xv.

grouped under the three subfamilies of Stichopoda, Gastropoda, and Sporadipoda, according as the ambulacral suckers were set in definite rows, and the interradii were altogether or almost completely devoid of suckers (e. g. *Cucumaria*), were confined to the trivium ("ventral surface") (e. g. *Psolus*), or were scattered more or less regularly over the whole body, as in *Thyone*.

Among the Sporadipoda, *Thyone* and *Stereoderma* alone had ten tentacles only; and, till the time of Ludwig's institution of *Pseudocucumis* and *Actinocucumis*, all Stichopods were thought to have ten tentacles or to be "decachirote."

The recent researches of Von Marenzeller have resulted in an emendation of the generic characters of *Colochirus*<sup>1</sup>, and have in principle removed it from the Stichopoda to the Sporadipoda, so that in place of saying with Semper "Die Füßchen der Bauchseite stehen in 3 deutlich von einander getrennten Reihen," we now say, with Marenzeller, "Die Ámbulacralfüßchen der Bauchseite stehen entweder in drei deutlichen Reihen oder nahezu regellos." While Von Marenzeller has demonstrated the inconstancy of the Stichopod arrangement in one of the Stichopoda, it has been my fortune to show<sup>2</sup> that the Sporadipod disposition of the ambulacral feet in *Stereoderma* is, in *S. murrayi*, carried further than it is in *S. unisemita*, the only species of the genus that was known in 1868.

We are then led to the conclusion that the disposition of the ambulacral suckers offers a less certain basis for arrangement than was supposed some years since. It might, indeed, well have been thought that as the Holothurian got further and further away from the parent stock which remained under the domination of the pentamerous disposition of parts, it would, as it began to develop more than five pairs of tentacles, have its sucker-feet developed in the interradii as well as the radial parts of the body. Such a theoretical consideration would find support in the fact that some forms as they grow older lose a stichopodous and acquire a sporadipodous arrangement of the sucker-feet; while a not unimportant consideration for the systematist is the variability of this character.

With regard to the former, however, opposing evidence is offered by the case of *Amphicyclus*, where, with in all 24 tentacles, we have the stichopod arrangement completely retained; and by the genus *Actinocucumis*, made known to us by H. Ludwig, where there is a stichopod arrangement, and from 18 to 20 tentacles.

As to the latter consideration, I should like to speak with diffidence till I have a better acquaintance than I have now with the species of the genus *Cucumaria*. As a matter of fact, however, systematists do, at this moment, unite under that head ( $\alpha$ ) stichopods with ten equal tentacles, ( $\beta$ ) stichopods with ten tentacles of which two are smaller than the rest, and ( $\gamma$ ) forms with eight large and two smaller tentacles, and some sucker-feet scattered in the interambulacra. Semper has hinted at the advantage of separating the last from the rest and forming for them a new generic group; but he

<sup>1</sup> Verh. zool.-bot. Ges. Wien, 1881, p. 129.

<sup>2</sup> P. Z. S. 1883, p. 61.

has not done more than give a hint, which has not till yet been acted upon.

Any statement as to the phylogeny of the Holothurians must be made with the greatest caution, for this reason, if for no other, that our knowledge of the palæontological history of the class is almost nil<sup>1</sup>. If, therefore, in what follows there appears to be anything like dogmatic statements, the student will remember that such a mode of presentation is often convenient on the score of brevity.

In distinguishing the two families of pedate Pneumonophorous Holothurians, the form of the tentacle is an important factor; in distinguishing the genera of one of these suborders is it not probable that the number and mode of disposition of the tentacles may be well taken into consideration?

Among the Dendrochirotae, some species of *Cucumaria* and *Psolus* alone retain the primitive arrangement of five pairs of equal tentacles: *Psolus* early left the common stock and is, really, a form which is only essentially modified in the gastropod or trivial disposition of its tube-feet. Some of the Cucumariæ acquired the differentiation of a pair of tentacles smaller than the rest; thence branched off *Ocnus* and *Colochirus*, in which the suckers tended to be confined to the trivium, and in which a large deposit of calcareous bodies was still retained in the integument; of *Colochirus*, *Stereoderma* is a more specialized form.

*Thyone*, with four pairs of longer and one of smaller tentacles, has a sporadipod arrangement of the ambulacral feet; in *Thyonidium* five pairs of smaller tentacles are developed in addition; in *Orcula* and *Phyllophorus* a sporadipod arrangement of suckers is associated with an irregular disposition of the feet; while in *Pseudocucumis* ten pairs of tentacles, in *Amphicyclus* twelve pairs regularly arranged, lead to *Actinocucumis* with its irregularly disposed tentacles but its stichopod feet.

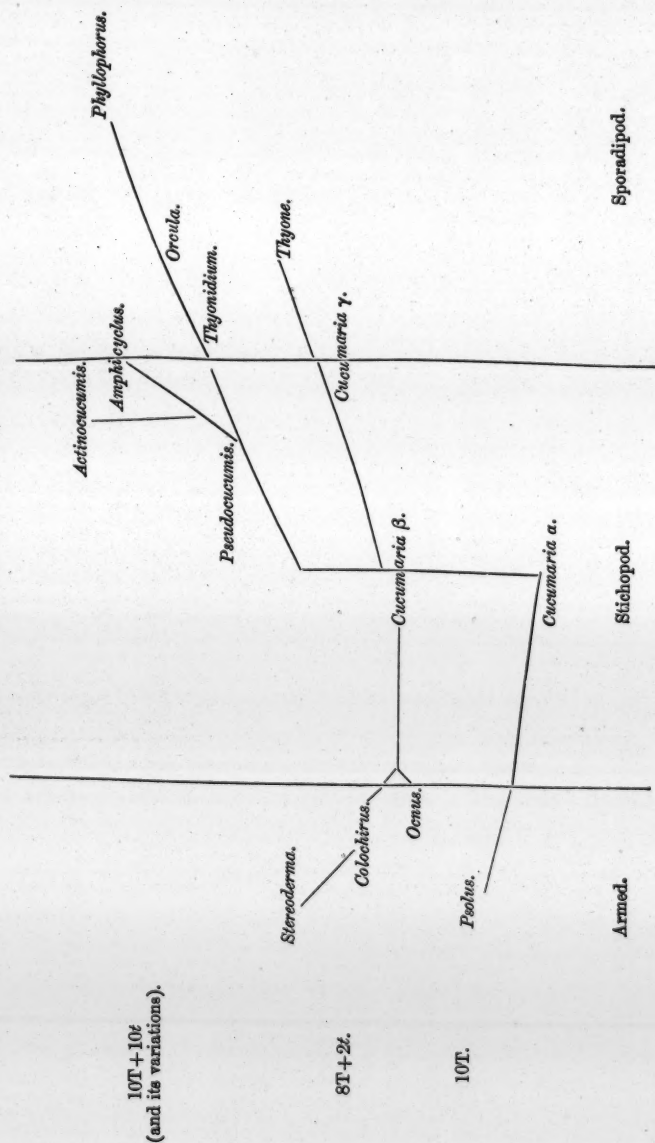
If, therefore, we retain the Semperian method of classification, we widely separate *Psolus*, with its primitively arranged tentacles, from *Cucumaria*; widely separate *Orcula* and *Phyllophorus*, with irregular and variable tentacles, from *Actinocucumis*; and place with the Stichopoda *Colochirus*, in which a sporadipod arrangement is perhaps not less rare than is a stichopod disposition in *Thyonidium*, which belongs to the Sporadipoda.

By writing T for the large primary tentacles, T' for the secondary (more than 10) large tentacles, and t for the small tentacles, we can at a glance see the relations of the genera in this particular.

<i>Cucumaria</i> . .	10 T or	8T + 2t.
<i>Psolus</i> . . . . .	10 T.	
<i>Colochirus</i> . . . . .		8T + 2t.
<i>Stereoderma</i> . . . . .		8T + 2t.
<i>Ocnus</i> . . . . .		8T + 2t.

<sup>1</sup> Consult the single page (pp. 559-60) devoted to Holothurians in Zittel's valuable 'Handbuch.'

TABLE OF THE GENERA OF DENDROCHIROTÆ.



<i>Thyone</i> .....	8T+2t.
<i>Pseudocucumis</i> .....	10T+10t.
<i>Thyonidium</i> .....	10T+10t.
<i>Amphicyclus</i> .....	14(T+T')+10t.
<i>Actinocucumis</i> .....	16 to 18(T+T')+2t.
<i>Orcula</i> .....	10 to 15(T+T')+5t.
<i>Phyllophorus</i> .....	12 to 16(T+T')+5 to 6t <sup>1</sup> .

I have tried, in the phylogenetic table which I append, to combine with the approved mode of presenting hypotheses the objective method used so successfully by Prof. Huxley in some of his later communications to this Society.

At the side I mark the stages of 10T, 8T+2t, and 10T+10t; along the middle rise the stichopod forms, to the left those that are more or less heavily armed, and to the right the strictly sporadiform forms.

An inspection of this table shows that the forms are now seen to be too closely and intimately allied to allow of the sharp differentiation into three groups which was suggested by Prof. Semper.

If, however, we have lost an artificial scheme, we have perhaps got one step nearer to a clear perception of the genetic relationship of the genera of the Dendrochirota; and, after all, it is better for us to recognize the tangled web and woof of the animal kingdom than, in these days, to be content with definitions overloaded with exceptions, or distinguishing marks that tell us nothing of the past, and give us but uncertain aid in the present. The day of linear classifications is gone.

### 3. An Account of the Land and Freshwater Mollusca collected during the Voyage of the 'Challenger' from December 1872 to May 1876. By EDGAR A. SMITH.

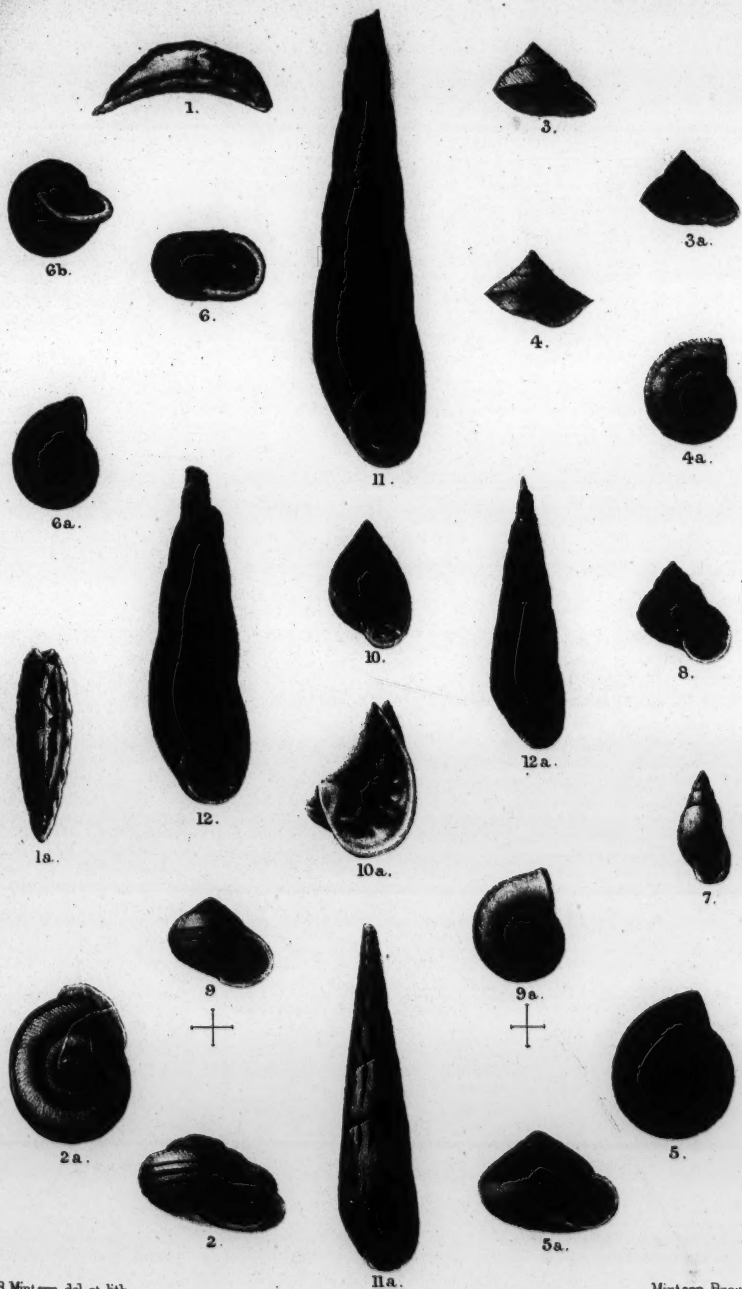
[Received April 4, 1884.]

(Plates XXII. & XXIII.)

The object of the voyage of the 'Challenger' having been "to investigate scientifically the physical conditions and natural history of the deep sea all over the world," it is not surprising that the number of terrestrial and fluviatile Mollusca brought home by the Expedition is comparatively small. Evidently no real attempt was made at collecting, but only such species appear to have been picked up as presented themselves to members of the scientific staff when on shore at the various localities. The whole collection comprises only 152 species, some of which, however, possess considerable interest, and several are new to science.

The following Report has been drawn up in as brief a manner as

<sup>1</sup> *Echinocucumis* would apparently have the formula of 8t+2T, and is possibly a slightly degraded form; I have omitted it from the phylum.

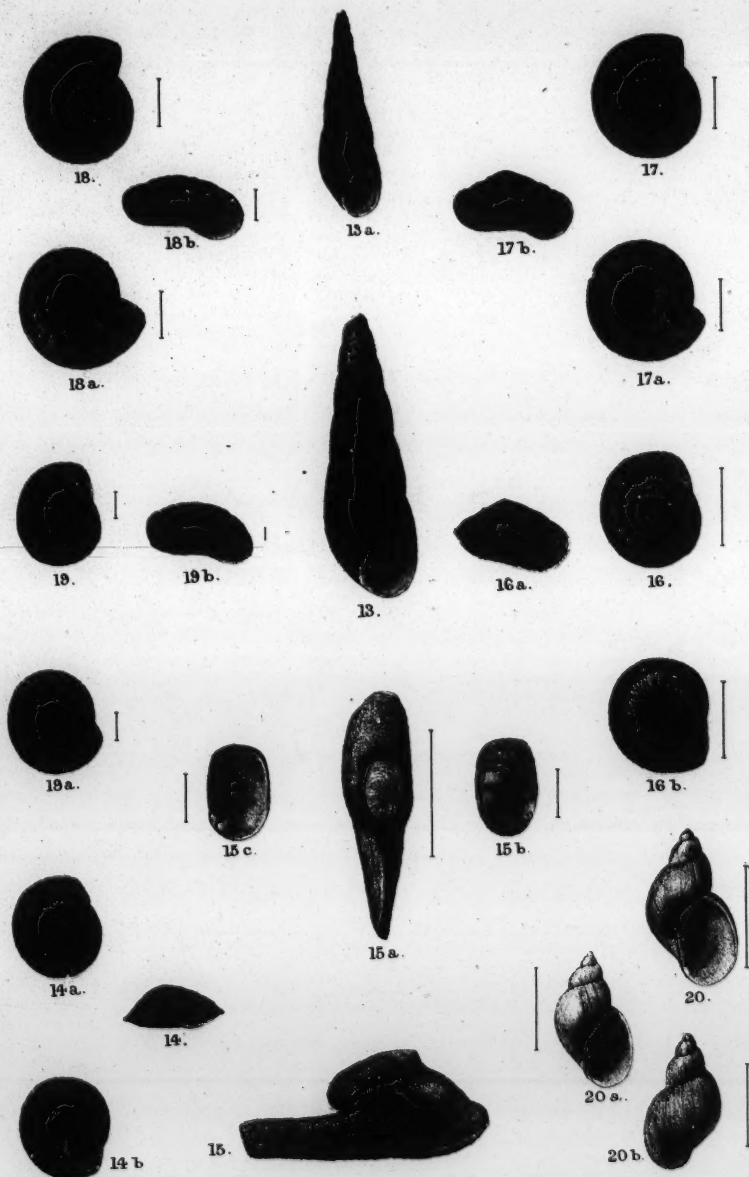


R. Minter, del et lith.

Minter Bros. imp.

NEW TERRESTRIAL AND FLUVIATILE MOLLUSCA  
FROM THE "CHALLENGER" EXPEDITION.





R. Minton, del. et lith.

Minton Bros. imp.

NEW TERRESTRIAL AND FLUVIATILE MOLLUSCA  
FROM THE "CHALLENGER" EXPEDITION.



possible, and very few references have been made to books, and little or no synonymy given, as in most instances the species are well known, and there is no likelihood of such as are mentioned being misunderstood without reference to descriptions and figures.

#### JAPAN.

Only a single pulmonate mollusk was brought from this country, namely *Philomycus bilineatus* of Benson, found at Yokohama. This species was originally described from specimens collected by Dr. Cantor at Chusan, and has also been recorded from Amur, and in the British Museum there are two specimens from the island of Formosa. The striping of the mantle appears to vary. Benson's example had a median stripe along the back and one on each side, just as in one of the two specimens from Chusan in the British Museum, the other having only the two laterals, the central part of the back being spotted and dotted with black, but not distinctly lined. The Formosan Slugs previously referred to have five stripes, two on each side and a central one. The 'Challenger' specimen has only a single lateral broad band on each side, the middle of the dorsal surface being black-dotted but not definitely striped.

#### MALAY OR EASTERN ARCHIPELAGO.

Twenty-two species of land and freshwater shells (none of them new forms) were collected at the Philippines, Moluccas, Ké, and Aru Islands. They are as follows:—

##### 1. NANINA CITRINA, Linn.

*Hab.* Amboyna, and Ké Dulan, Ké Islands.

Six specimens of immature growth were collected at the former locality, representing three varieties of this polymorphous species. All are thin and have a silky upper surface, with the exception of the apex, which is glossy, as is the case with the lower surface. One example is uniformly pale greenish yellow, with an opaque yellow peripheral zone and a narrow infrasutural band of the same tint. Two others are similarly ornamented, but in addition have a rich brown zone above the opaque yellow one at the periphery. The remaining three examples are pinkish brown above, and pale, semi-transparent, and faintly yellow below, encircled at the middle by the usual whitish band, which is margined above with a zone of somewhat darker hue than the general tint of the upper surface, into which it insensibly blends. There is also a white narrow line beneath, but at the suture.

The five shells from Ké Dulan, a locality hitherto I believe unassigned to this species, are remarkable for their solidity, one of them also being unusually conical in the spire. They are glossy, lacking the silky appearance obtaining in the Amboyna examples, which may be present perhaps only in younger specimens. They are lemon-yellow and differently banded. Two have a broad opaque

whitish zone at the periphery and a very narrow one a little above; also a broad band beneath the suture, and the linear one, above referred to, immediately above. The remaining specimens differ in having, above the peripheral white band, a rich brown one, which is continuous up the spire just above the sutural line.

2. *HELIX (PHILINA) BIGONIA*, Férussac.

*Hab.* Melanipa, Basilan Straits, Philippines.

The single dead shell at hand is of a rather depressed form, the body-whorl in consequence being more acute or subcarinate around the middle. The species has been recorded from Samar, another island of the Philippine group.

3. *HELIX (PLANISPIRA) ZONARIA*, Linn.

*Hab.* Amboyna.

4. *HELIX (PLANISPIRA) TORTILABIA*, Lesson.

*Hab.* Amboyna, Moluccas, and Aru Islands.

The specimens from both these localities belong to the variety D in Martens's account of the land-shells of the 'Preussische Expedition nach Ost-Asien,' being wax-yellow, unbanded, and having a white peristome. On p. 392 of this work he questions the correctness of Amboyna as the home of this species; but in this instance the Cumingian collection is not at fault, as so frequently is the case.

5. *HELIX (ALBERSIA) ZONULATA*, Férussac.

*Hab.* Aru Islands, and Amboyna, Moluccas.

6. *HELIX (CAMENA) SANZIANA*, Hombron and Jacquinot.

*Hab.* Melanipa Island, Philippines.

This species was collected by Mr. Cuming at Samboanga, south of the island of Mindanao. This place is not far from Malanipa, a very small island in the strait between the former, Mindanao, and Basilan to the south.

7. *HELIX (GEOTROCHUS) PILEUS*, Müller.

*Hab.* Aru Islands.

8. *HELIX (GEOTROCHUS) GÆRTNERIANA*, Pfeiffer.

*Hab.* Aru Islands.

9. *HELIX (HELICOBULIMUS) SARCINOSA*, Férussac.

*Hab.* Hoilo, Philippines.

10. *BULIMUS (ORTHOSTYLUS) FAUNUS*, Broderip.

*Hab.* Cebu, Philippines.

11. *BULIMUS (CANISTRUM) FULGETRUM*, Broderip.

*Hab.* Hoilo, Philippines.

12. *LEPTOPOMA MELANOSTOMA*, Petit.

*Hab.* Amboyna, Moluccas.

Both the white- and black-lipped varieties were met with at the above locality. This species is usually regarded as an Aruan shell, so it is interesting to find it ranging further northward. Of the eleven Amboynan specimens at hand, only two have a black peristome, which may not, however, at all closely indicate the proportional number existing in nature—indeed, may be altogether misleading, for this variety may in truth predominate.

13. *LEPTOPOMA VITREUM*, Lesson.

*Hab.* Melanipa Island, Basilan Strait, Philippines.

Of five specimens from this locality two are totally white, one livid lilac, one faintly stained with brown, getting darker towards the apex, and the remaining one coloured like the last but marked in addition with several obliquely wavy pale brown lines.

14. *HELICINA IDÆ*, Pfeiffer.

*Hab.* Amboyna, Moluccas.

15. *PYTHIA SCARABÆUS*, Linn.

*Hab.* Amboyna, Moluccas; Ké Dulan, Ké Islands; Dobbo, Wokan, and Wanumbai, Aru Islands.

A series of about thirty specimens from Ké Dulan shows that *P. castanea*, Reeve (non Lesson), is merely a variety of this species, which is subject to variation in size and markings. They average about 24 millim. in length and 14 millim. in width.

*P. pantherina*, A. Adams, also appears to be a mere variety, possessing no distinctive features. In some stages of growth in certain specimens the umbilicus is altogether closed, in others partly so, whilst in large shells it is fairly wide and deep.

16. *PYTHIA WALLACEI*, Pfeiffer (var.).

*Hab.* Amboyna, Moluccas.

The typical form of this species was described from specimens collected by Mr. Wallace at Batchian, another of the Molucca Islands. The Amboyna specimen obtained by the 'Challenger' differs in having the whorls of the spire rather more convex, and the upper parietal denticle is not prolonged upwards quite so distinctly, which, however, may be due to age, for it is not apparently full-grown. In the British Museum there are four specimens from the Aru Islands which are similarly abnormal with regard to this tooth, in other respects corresponding very closely with the Batchian shells.

17. *MELANIA SOBRIA*, Lea.

*Hab.* Pasananca, near Zamboanga, island of Mindanao.

The two specimens from the above locality belong to the same type as those collected by Mr. Cuming on the island of Siquijor (vide Reeve, Conch. Icon. f. 32). They are yellowish olive, with a

yellowish band beneath the suture, the uppermost whorls of the spire (some of which are obliquely costate) being ornamented with squarish spots both above and at the lower part.

This species is quoted by Dr. Brot from Halmaheira, Solomon Islands, and Wokan, Aru Islands.

18. *MELANIA AEREA*, Reeve.

*Hab.* Camiguin Island, Philippines.

It is not mentioned either by Reeve or Brot from which of this group of islands their specimens were obtained. The two 'Challenger' shells are smaller than the type figured by Reeve, being only  $1\frac{1}{4}$  inch long. One of them has rather more convex whorls than the other, with their upper part comparatively unsculptured; the latter, on the contrary, being spirally sulcate throughout. Both are more or less coated with a dark reddish earthy deposit.

19. *MELANIA*, sp.

*Hab.* Aru Islands.

Four specimens of a small *Melania* were collected, which approach very closely to several species, judging from the published figures. They are very like *M. christobalensis* of Brot (Conch.-Cab. pl. 21. figs. 16, 16 a), except that the whorls are shorter. Beneath a black earthy coating they are olivaceous, merely sculptured by lines of growth, and all eroded at the upper part of the spire, leaving only four volutions remaining. As many as thirteen species have already been recorded from the Aru Islands.

20. *NERITINA VARIEGATA*, Lesson.

*Hab.* Aru Islands.

The colours of the eleven specimens from these islands are, with the exception of a small part of the body-whorl above the columella, entirely concealed by a black earthy deposit. The red patch on the columella is very vivid in some of them and paler in others. The aperture is bluish white outside and greenish within the operculum, which corresponds exactly with the description given by Dr. von Martens (Conch.-Cab. ed. 2, p. 99). All the specimens have the apex more or less eroded, but not to the extent of *N. wallisianum*, Récluz, which is but a large variety of this species, of which there are specimens in the British Museum from the Fiji and Navigator Islands.

21. *NERITINA CORNEA*, Linn.

*Hab.* Amboyna.

For the distribution of this species see Martens's monograph in the 'Conchylien-Cabinet.'

22. *NERITINA BREVISPINA*, Lamarck.

*Hab.* Camiguin, Philippine Islands.

Of the three specimens collected all agree in having the suture bordered below with an interrupted black band, but otherwise are

differently coloured. Two are olivaceous, and dotted over with small triangular yellowish black-bordered spots, the third being more yellow and minutely speckled all over with black. Although the shells differ so much in painting, their opercula are precisely similar, agreeing perfectly with the description given by Martens in the work referred to previously.

#### ADMIRALTY ISLANDS.

Of the twelve species of land and freshwater Mollusca obtained at these islands nine appear to be undescribed. This is not altogether surprising, as they were chiefly collected in a small island (Wild Island) off the north-west of the main island, which in all probability had not, previously to the visit of the 'Challenger,' been visited by any naturalist or collector.

##### 1. *ATHORACOPHORUS VIRGATUS*. (Plate XXII. figs. 1, 1 a.)

Animal (in spirit) nearly three times as long as broad, widest across the middle, much flattened and somewhat tapered posteriorly, convex above, not carinated, of a buff colour, with five irregular stripes down the back of a blackish tint, smooth, with only faint indications of a central and lateral groove, as in the type of the genus. Foot very broad, uniformly buff, thin-margined at the sides. Respiratory orifice small, situated about midway between the centre of the dorsal surface and the margin of the foot; from the opening a narrow groove runs obliquely forward to the middle of the back, and, then bifurcating, passes outside the ocular tentacle on each side. Oral opening (in contraction) surrounded by a thickened rim, tripartite above. Horny jaw with a concave cutting-edge and a small triangular projection at the middle, laterally produced beyond the side margins. The shell is represented (one specimen only has been examined) by eight minute calcareous particles of different shapes and sizes (the largest being about  $1\frac{2}{3}$  millim. long) situated on the central line of the back a little in front of the respiratory orifice.

Length 27 millim., diam. 10, height 8.

*Hab.* Wild Island.

This species differs from *A. bitentaculatus* of New Zealand in the more lateral position of the respiratory opening.

##### 2. *HELIX (GEOTROCHUS) MOSELEYI*. (Plate XXII. figs. 2, 2 a.)

Shell imperforate, obtusely and depressedly conoid, moderately solid, seldom totally whitish, generally encircled with one or more narrow brown lines. Whorls 4, convex, sculptured with fine lines of growth and minute indented wrinkly striae, except upon the two nuclear whorls, which are smooth, pellucid, destitute of the spiral brown lines, and form a very obtuse apex; the last whorl is obtusely angled at the periphery, convex beneath, and descends obliquely in front rather suddenly. The aperture is a little oblique, and exhibits the external banding. Peristome white, much expanded and reflexed on the outer and basal margin. Columellar margin oblique,

reflexed and appressed over the umbilical region, and joined to the extremity of the outer lip by a thin callosity.

Greatest diameter 23 millim., smallest 19, height 15.

*Hab.* Wild Island.

The bands on this interesting species are usually three in number, one just below the periphery and two above it. In some specimens there is an additional one above, in others there are but two altogether, sometimes both above the middle, or again one of them being beneath; in other examples there may be only a single line either above or below the centre; and, finally, others are altogether unbanded. It recalls to mind *H. eddystonensis*, Reeve, which differs in being umbilicated, more acute at the periphery, more conical in the spire, with a sharper apex.

3. *HELIX* (*GEOTROCHUS*) *LABILLARDIEREI*. (Plate XXII. figs. 3, 3 a.)

Shell small, imperforate, somewhat trochoid, totally white, or with a broad suffused brownish band below the middle of the body-whorl, or entirely light pinkish brown, always tipped with dark brown at the apex. Whorls 5, rather rapidly enlarging, moderately convex, sculptured with fine lines of growth and microscopical spiral striæ; last rather sharply keeled at the middle, scarcely descending in front, and a little convex beneath. Aperture small, oblique, coloured like the exterior. Peristome white, broadly expanded, very slightly reflexed, thickened within the basal edge by a pale pinkish ridge.

Greatest diameter 15 millim., smallest  $12\frac{1}{2}$ , height  $10\frac{1}{2}$ .

*Hab.* Wild Island.

Two characters are quite constant in this species—the dark coloured apex, and the peculiar thickening within the basal margin of the aperture. *H. helicinoïdes*, Hombron and Jacquinot, is related to this species, but differs in wanting the above peculiarities.

4. *HELIX* (*HEMIPLECTA*) *INFRASTRIATA*. (Plate XXII. figs. 4, 4 a.)

Shell thin, semitransparent, corneous, narrowly perforate, depressedly concavely conical. Whorls 6, slightly convex, slowly enlarging, margined above the suture with a thread-like keel, very slightly glossy, sculptured with fine lines of growth, and more or less with microscopic spiral striæ; spire somewhat elevated, with concave outlines; last whorl acutely carinate at the middle, not descending in front, a little convex beneath, glossy, marked with lines of increment and fine concentric wavy striæ. Aperture oblique, angularly lunate. Peristome thin, not expanded or reflexed. Columellar margin almost perpendicular, expanded and reflexed over the narrow perforation.

Greatest diameter 15 millim., smallest 13, height  $10\frac{1}{2}$ .

*Hab.* Dentrecaesteaux Island, Admiralty Group.

This species bears some resemblance to *H. eucharis*, Deshayes (non Reeve), but has a more concave spire, is more sharply keeled, and somewhat differently sculptured. The single shell described

does not probably indicate the full dimensions attained by the species, for it has the appearance of being rather young.

5. *HELIX* (*HEMIPLECTA*?) *CARTERETI*. (Plate XXII. figs. 5, 5 a.)

Shell narrowly perforate, rather solid, depressedly conical, fulvous brown above, rather paler beneath. Whorls 7, moderately convex, slowly enlarging, divided by a deepish suture, sculptured with oblique lines of growth and very minute microscopic spiral striæ; last whorl with an obtuse keel at the periphery, somewhat wrinkled beneath, peculiarly contracted a little behind the aperture; the latter narrowly lunate, flesh-tinted within, subhorizontal. Peristome strong, not reflexed or expanded, slightly dilated over the perforation. Spire shortly conical, with faintly convex outlines.

Greatest diameter 22 millim., smallest  $18\frac{1}{2}$ , height 15.

*Hab.* Wild Island.

This is a very distinct form, remarkable for the peculiar pinched character of the last whorl a little behind the aperture. *H. novæ-hiberniæ* has a faint resemblance to it, but is more regular in growth, brown-banded above the periphery, with a different form of aperture. I have named the species after Capt. Carteret, who discovered this group of islands in 1767.

6. *HELIX* (*CHLORITIS*) *DENTRECASTEAUXI*. (Plate XXII. figs. 6, 6 b.)

Shell depressed, narrowly umbilicated, light brown, marked with fine lines of growth, and everywhere finely punctate, and probably pilose in a fresh condition. Spire slightly sunken below the body-whorl. Volutions 5, convex above, separated by a deepish suture, slowly enlarging; the last somewhat inflated, a little descending anteriorly, having two indentations—one, elongate, about the middle of the whorl, at a short distance from the lip, the other nearer the labrum, just under the base, both forming denticular prominences within. Aperture oblique, narrowly lunate. Peristome whitish, thickened, reflexed everywhere, the extremities being united by a thin callosity spreading over the whorl.

Greatest diameter 17 millim., smallest 14, height 10.

*Hab.* Wild Island.

This remarkable species is readily distinguished from its allies by the peculiar indentations on the body-whorl forming within the aperture pseudo-denticles. As compared with Pfeiffer's figure of *H. eustoma* (Novitat. Conch. ii. pl. 38. f. 3-5), also from the Admiralty Islands, it will be seen that this species has a more depressed spire, a narrower umbilicus, and a narrower aperture.

7. *PARTULA* *HARTMANNI*. (Plate XXII. fig. 7.)

Shell elongate, conical, thin, semipellucid, white, narrowly umbilicated. Whorls  $5\frac{1}{2}$ , slightly convex, sculptured with minute microscopic spiral striæ and fine oblique lines of growth, which give the upper edge of the whorls a slightly puckered appearance; last

whorl long, a little contracted behind the aperture, and marginate beneath the suture near the lip. Aperture almost perpendicular, somewhat ear-shaped, dirty whitish within, together with the peristome equalling rather less than half the total length of the shell. Lip somewhat flattened and expanded. Columellar margin reflexed, not twisted or tubercular; outer margin above well bent over towards the columella, with which it is united by a thin callus.

Length  $16\frac{1}{2}$  millim., diam. 7; aperture 8 long,  $5\frac{1}{2}$  broad.

*Hab.* Wild Island and Pigeon Island.

*P. elongata*, Pease, and *P. gracilis* of the same author, from the Tahiti group, closely resemble this species. The former is rather larger and broader, not so strongly spirally striated, and more or less striped with pale brown. The latter has a longer aperture, rather more convex apical whorls, and a peculiar bulging at the lower part of the body-whorl. *P. minuta*, Pfr., also from the Admiralty Islands, is similarly sculptured, but of a totally distinct form.

#### 8. CYCLOSTOMA INFANS. (Plate XXII. fig. 8.)

Shell small, moderately umbilicated, thinnish, light brownish red, more or less variegated and streaked with white above, turbinate-conoid, obtusely angled at the periphery. Whorls 5, considerably convex, divided by a deep suture; upper ones rather more lightly coloured than the last, faintly spirally striated; last whorl crossed by oblique lines of growth, encircled above the middle by about ten thread-like liræ, with the lower part rather more finely liræ, scarcely at all descending in front. Aperture subcircular, brown within, with a pale narrow band at the periphery. Peristome thin and scarcely expanded on the outer margin, a little thickened at the base of the columella, which has the free edge somewhat sinuated. Columella and upper extremity of the outer lip united by a thin glossy callus.

Greatest diameter  $5\frac{2}{3}$  millim., smallest  $4\frac{1}{3}$ , height 6.

Operculum shelly, white, slightly concave, consisting of four whorls, exhibiting a few spiral striæ and a central nucleus.

*Hab.* Wild Island.

This species appears to be closely related to *Cyclotus poirierii*, of Tapparone-Canefri, from the southern part of New Guinea. It is a little smaller, has a whorl less, and the peristome is not double as in that species. *Cyclostoma pygmeum*, from New Ireland, is of a different form, has stronger sculpture on the base of the body-whorl, and a different columellar margin.

#### 9. HELICINA PONSONBYI. (Plate XXII. figs. 9, 9 a.)

Shell small, globose-conical, uniformly yellow, or sometimes with a reddish band around the lower part of the upper whorls, which becomes paler upon the last, and is situated just above the periphery. Volutions  $4\frac{1}{2}$ , a little convex; the last rather globose, rounded at the periphery, not descending in front, expanded somewhat at the aperture, sculptured with fine lines of growth and indi-

cations of spiral striæ on the under surface. Spire shortly conical, obtuse at the apex, with almost straight lateral outlines. Aperture moderately large, yellow within, subsemicircular. Peristome semipellucid, slightly expanded and thickened, generally margined externally with a whitish stripe. Columellar side of the aperture oblique, coated over the umbilical region with a glossy yellow callosity, slightly channelled at the base.

Greatest diameter 6 millim., smallest 5, height 5.

Operculum thin, slightly concave externally, minutely rugose, yellowish on the straight or columellar side, brownish or reddish brown towards the outer edge, which is very finely carinate.

*Hab.* Wild Island and Pigeon Island.

This species is very like *H. modesta*, Pfr., from the island of Tanra, but has a slightly larger mouth, a yellow basal callus instead of a whitish one, and a different operculum, that of *H. modesta* being thicker, more shelly, concave in the centre, with a broad flattened raised rim all round the convex side and a raised but not flattened margin on the straight side.

#### 10. PYTHIA SCARABÆUS, Linn.

*Hab.* Wild Island.

A large number of specimens were brought home from this locality. They are, as a rule, rather larger than those obtained by the Expedition at the Ké Islands, having an average length of about 29 millim. and a width of 17. They vary in colour, some being painted like typical variegated forms, and others more uniformly tinted like *P. pollex*, Hinds, and *P. albivaricosa*, Pfeiffer, which might be regarded as local varieties apparently offering no structural differences.

#### 11. MELANIA ARTHURII, var.?

*Hab.* Wild Island, Admiralty Islands.

As far as I can ascertain, no species of *Melania* has been recorded from these islands. The single shell at hand, which had been seized upon by a *Pagurus*, approaches so closely to *M. arthurii* (Brot) that I think it will probably prove only a variety of that species. It is decollated above, four and a half whorls only remaining, of which the two uppermost, however, show the longitudinal costæ occurring in that species. The rest of the surface is spirally densely striated and sculptured with rather elevated lines of growth. It is of a dark brown tint, slightly paler at the margination below the suture, beneath which there is a series of oblique dark oblong spots. The whorls are slightly convex, and somewhat contracted just below the upper marginate edge.

#### 12. NERITINA CORNEA.

*Hab.* Wild Island.

The two specimens correspond to the form figured by Martens in his Monograph (Conchyl.-Cab. pl. 12. f. 15).

## NEW HEBRIDES.

The seven species of shells from these islands were all collected at the small island of Api, which "lies south of Amboyna and Maticolo and between these islands and Efate or Sandwich Island," and which, according to Moseley, "had certainly never been landed upon before by any scientific man or naval officer" until the visit of the 'Challenger.' It is not surprising, therefore, that of the few species brought home four are apparently new, although it is with some reluctance that I name forms so variable and puzzling as the *Melanæ* of the South-Sea Islands.

1. *HELICINA SUBLÆVIGATA*, Pfeiffer.

*Helicina sublævigata*, Pfeiffer, Proc. Zool. Soc. 1853, p. 87; Monog. Pneumon. p. 384; Sowerby, Thes. Conch. vol. iii. p. 290, pl. 275. figs. 339 & 340; Conch. Icon. vol. xix. pl. 29. figs. 265 a, b.

The seven specimens from Api are all much smaller than the types described by Pfeiffer, and belong to the unbanded variety, one of them being of a pinkish-red tinge and the rest yellower. A feature worth noticing, and which has hitherto been overlooked, is the peculiarity of the apex of the spire. The first whorl is convex and smooth, and abruptly defined from the next, which is sculptured at its commencement with three or four strong spiral ridges, which, however, soon disappear.

The figures in the 'Thesaurus' are somewhat enlarged, but give a very fair notion of the form, those in the 'Conchologica Iconica,' on the contrary, being too depressed and too acute at the periphery. Sowerby, in his description in the latter work, characterizes the lip as red, which is very unusual; for out of a dozen shells with perfect lips all have them white at the margin with one exception, in which it is orange like the rest of the aperture.

2. *PYTHIA SCARABÆUS*, Linn.

*Hab.* Api, New Hebrides.

The largest of the specimens from this locality are about 25 millim. in length. They might with equal propriety be named *P. ovatus*, Pfeiffer, *P. suvaiensis*, Mousson, or *P. regularis*, Gassies, which I regard in the light of mere varieties. As in the case with the examples from the Ké Islands previously referred to, so also among those from Api, many are found with the umbilicus quite closed and others with it partially open, the former probably being identical with *P. tortuosa*, Mousson. Dr. Cox (Proc. Linn. Soc. New S. Wales, vol. vi. p. 621) has also recorded that some specimens of *P. verreauxi* "are absolutely imperforate, whilst others are openly umbilicated."

3. *PYTHIA APIENSIS*. (Plate XXII. figs. 10, 10 a.)

Shell small, ovate, pyramidal, either narrowly perforate or imperforate, livid brownish, with the back of the body-whorl dirty yellowish, irregularly spotted with brownish black, or uniformly

dirty yellowish variegated with brown spots. Whorls 10, nearly flat, faintly marginate beneath the suture, finely striated lengthways. Outer lip considerably expanded towards the lower part, dirty whitish, marked with a few pale brownish spots near the margin and armed within with six denticles, of which the first, second, fourth, and sixth, counting from the upper end, are minute, the third and fifth being a trifle larger and generally of a light-brown or yellowish tint. There are two parietal teeth and a minute tubercle just under the lower one, which is lamelliform, the upper one being very like that of *P. scarabæus*. Columellar tooth transverse, produced a little way across the reflexed margin, which is yellowish at this part, as also are the denticles on this side of the aperture. The labrum is pale externally, and exhibits the usual dark oblique stripe at a short distance from the margin.

Length 19 millim., diam. 12; labrum 11 long,  $7\frac{1}{2}$  broad.

This species has the general appearance of a dwarfed form of *P. scarabæus*; but may be distinguished by the different armature of the aperture, which is perfectly constant in all the seventeen specimens examined. It possesses an additional basal denticle on the outer lip, and a minute tubercle on the body-whorl between the columella and the lower of the parietal teeth. The position of the aperture is also more lateral, but rather less so than in *P. ceylonica*.

#### 4. MELANIA APIENSIS. (Plate XXII. figs. 11, 11 a.)

Shell elongate, subulate, covered with an olive-brown or yellowish-olive epidermis, variegated with oblique red lines beneath the sutures, which, in some specimens, are produced in a wavy manner across the whorls and in others are interrupted at the middle, or, again, some of the stripes may be continuous and others interrupted on the same whorl. Volutions probably about 15 in number, but invariably more or less broken off above, with almost flat sides or but the slightest convex, exhibiting only the very faintest constriction below the suture, which is considerably oblique and deep. The sculpture consists of fine lines of growth and a variable number of spiral striae, those around the base of the body-whorl and a few at the lower part of the upper whorls being deep and pretty constant, and in some specimens one or two revolving below the suture produce a marginate appearance to the whorls. The aperture is pyriform, of a lead-colour, and the columella white.

Length of six remaining whorls of the largest specimen 70 millim., diam. of last whorl 17.

This form may be only a variety of *M. scipio*, Gould, from the Samoa and Fiji Islands, but coming from another locality offers certain differences in coloration and sculpture which appear to distinguish it. In painting, some specimens agree with *M. figurata*, Hinds; but none of them have the whorls plicate beneath the suture as described by that author.

#### 5. MELANIA TURBANS. (Plate XXII. figs. 12, 12 a.)

Shell elongate, subulate, covered with an olivaceous epidermis,  
Proc. Zool. Soc.—1884, No. XIX.

generally with a few inconspicuous red lines beneath the suture and at the middle of the body-whorl. Whorls 9?, long, very slightly convex, divided by a moderately oblique suture, more or less longitudinally plicate and spirally striate. Aperture about the same as in *M. apiensis*.

Supposed length 63 millim., diam. of last whorl 14; aperture 15 long, 10 broad.

The plications in this species are more strongly developed in some specimens than in others, and become somewhat obsolete towards the lower part of the whorls, and being cut across by the spiral striæ, which are not very close together (perhaps a dozen on the penultimate volution), are somewhat subgranose. The striæ also at times are more or less wanting. The apex of this species, as in some others, becomes peculiarly eroded, leaving only the central black column like a piece of thin wire remaining.

#### 6. *MELANIA ORDINARIA*. (Plate XXIII. figs. 13, 13 a.)

Shell like *M. turbans*, but with rather shorter whorls, smaller, smooth, without longitudinal plicæ, and with only a few indications of spiral striations, except at the lower part of the body-whorl, where it is finely striated. Body-whorl broader and shell generally more slender; without red markings as a rule, judging from nine specimens at hand, of which only two exhibit a few short narrow lines below the sutures. It is a less slender species than *M. apiensis*, with less and finer spiral sculpture, and without the conspicuous red markings of that shell.

Probable length 50 millim., diam. 13.

#### 7. *NERITINA SIDEREA*, Gould.

About thirty small specimens of this species were collected at Api. The majority of them are almost entirely black, with the exception of the eroded apex, which is white. Two specimens, however, are white, with numerous wavy black lines leaving a number of small, white, triangular spots. The species has previously been recorded from the Fiji Islands, Roratonga, and Samoa Islands; and a large variety, collected at the Solomon Islands by Mr. J. Brazier, is mentioned in the Proc. Linn. Soc. vol. xii. Zoology, p. 556.

#### Fiji Islands.

Only a single novelty appears among the sixteen species collected at these islands, which are as follows:—1. *Placostylus morosus*, Gould; 2. *P. seemanni*, Dohrn; 3. *P. rambiensis*, Garrett; 4. *Helix (Xesta) pfeifferi*, Philippi; 5. *H. (Trochomorpha) latimarginata*, sp. n.; 6. *Helicina tectiformis*, Mousson; 7. *H. beryllina*, Gould; 8. *Neritina prichardi*, Dohrn; 9. *N. variegata*, Lesson; 10. *N. sandalina*, Récluz; 11. *N. porcata*, Gould; 12. *N. rubida*, Pease; 13. *Navicella freycineti*, Récluz; 14. *Nav. macrocephala*, Le Guillou; 15. *Nav. bougainvillei*, Récluz; 16. *Batissa tenebrosa*, Hinds. These were not all obtained at one particular island—Nos. 1, 3, 5, 6,

7, 8, 13, and 14 being from Ovalau; 2, 4, 9, 10, 11, 12, and 15 from Kandavu, and No. 16 from the Wai Levu, Viti Levu.

**HELIX (TROCHOMORPHA) LATIMARGINATA.** (Plate XXIII. figs. 14-14 b.)

Shell depressed, acutely keeled, arched above, very slightly convex beneath, deeply and rather narrowly umbilicated, uniformly dull pale brownish. Whorls 5, slowly increasing; the last convex above, compressedly broadly marginate above the suture, sculptured with oblique lines of growth, last near the aperture but very slightly broader than the preceding, compressed both above and below the sharp carina. Aperture small, with the basal margin receding and thickened.

Greatest diam. 15 millim., smallest 14; height 7. Umbilicus about  $2\frac{1}{2}$  wide.

This species belongs to the same group as *H. eurydice*, Gould, *H. cressida*, Gould, *H. swainsoni*, Pfr., *H. apia*, Hom. & Jacq., and some others, but does not seem to fall among the varieties of any. The narrowness of the last whorl, the broad margination above the suture (the margination being a little darker than the rest of the surface), the dull uniformly pale brownish colour, the thickened lower margin of the aperture, and the flattish lower surface are the principal distinguishing features of this species.

#### FRIENDLY ISLANDS.

Eight species collected at Tongatabu have all been previously recorded from these islands, and, with the exception of *Nanina tongana*, are not restricted in their distribution to this group, the majority having been met with at the Samoa Islands somewhat further north. The species are—1. *Nanina perpolita*, Mousson; 2. *N. tongana*, Quoy & Gaimard; 3. *Helix (Patula) gradata*, Gould; 4. *Helicina fulgora*, Gould; 5. *H. musiva*, Gould; 6. *Omphalotropis variabilis*, Pease; 7. *Physa sinuata*, Gould; 8. *Melania inhonesta*, V. d. Busch.

#### SOCIETY ISLANDS.

The following eight species were collected at Lake Waihiria on the island of Tahiti.

##### 1. NANINA TONGANA, Quoy & Gaimard.

A single specimen only was obtained, agreeing in every respect with others collected at Tongatabu. This appears to be the same species as *Helix conula* of Pease, also founded on Tahitian shells.

##### 2 & 3. PARTULA, sp.

Seven specimens of this genus in worn condition apparently belong to two distinct species which I have been unable to identify, and which it would be unwise to describe as new without paying special attention to the whole of the genus.

4. *Succinea humerosa*, Gould.
5. *Succinea papillata*, Gould.
6. *Succinea* (*Truella*) *infundibuliformis*, Gould.
7. *Melania lancea*, Lea.

The specimens from Lake Waihiria which I regard as belonging to this species have only four or five whorls remaining, which are regularly spirally striate throughout, whilst in the type figured by Reeve (*Conch. Icon. fig. 39*) eight volutions remain, and the striae upon the last four are wanting at the upper part.

8. *Physa*, sp.

A small ordinary form.

AUSTRALIA.

Examples of nine land and freshwater Mollusks were brought home from Continental Australia, namely:—*Helix bipartita* (Férussac), from Somerset, Cape York, *Parmacochlea fischeri*, also from Cape York, *Neritina souverbiana* from Flinder's Passage, and the rest from Sydney. These are *Helicarion robustus*, *Triboniophorus graeffei*, *Limax flavus*, *Ophiocardelus australis* (Q. & G.), *Melania balonensis* (Conrad), and *Corbicula minor* (Prime). Among these it is worthy of remark that one, *Limax flavus*, is a European species, and another, *Parmacochlea fischeri*, forms a very remarkable new genus. I herewith append a few notes upon the new and most interesting forms.

*LIMAX FLAVUS*, Linn.

*Hab.* Sydney.

A single specimen, only three quarters of an inch in length, was presented to the officers of the 'Challenger' by Dr. Cox of Sydney. In the British Museum there are two others, an inch and three quarters long, which also came from the same locality. After a very careful comparison with British examples, I am unable to detect any differences, and therefore conclude that this species has been introduced into Australia probably along with European plants.

*HELICARION ROBUSTUM*, Gould.

*Hab.* Near Sydney, New South Wales.

There are two specimens which agree perfectly with Gould's description and figure of this species, but I may add that the correct identification of certain closely allied forms is almost impossible without the comparison of actual types. Such forms are *H. freycineti*, Férussac, *H. cuvierii*, Férussac, *Vitrina verreuxi*, *V. virens*, *V. strangei*, *V. leucospira*, all of Pfeiffer, *V. mastersi*, Cox, and *V. inflata*, Reeve.

The animals of the two shells under examination correspond very closely with Férussac's figures (*Hist. Nat. Moll., Atlas, vol. i. pl. 9 A. f. 1-4*). The sole and side-margins of the foot are buff-colour, the

upper part blackish. The expanded mantle-lappets are also spotted with black. The foot is carinate above for a short distance from the extremity, which is abruptly truncate, having the usual terminal mucous pore.

PARMACOCHLEA, gen. nov.

Animal very like that of *Parmarion*, but differing in the construction of the shell. Shell almost concealed beneath the mantle, flattened, oblong, having the nuclear portion in the form of a minute *Sigaretus*-like shell projecting from beneath.

This genus appears to offer no distinction from *Parmarion* of Fischer, excepting with regard to the shell. This takes the form of a slightly convex thinnish disk, which, viewed externally, appears to consist of two whorls, the nuclear one being very small, transparent white, and shelly. The second is large, glossy, thin, covered with a thin horny epidermis, marked with fine lines of growth, and attached only to the left or curved side of the first whorl, the right side of which is nearly straight. Beneath, the first whorl is white and forms as it were a minute *Sigaretus*-like shell standing out free from the slightly concave last volution, which is more or less tinted like the exterior.

PARMACOCHLEA FISCHERI. (Plate XXIII. figs. 15-15 c.)

In spirit this species has the general lateral aspect of *Parmarion extraneus* as figured by Férussac (Hist. Moll. pl. 8 F. fig. 4). The mantle, however, is carried further forward over the head, the shield is higher in front, the opening in the mantle through which the shell is seen more central, and the truncation at the posterior extremity is inclined in the opposite direction. The foot is narrow, equally tripartite beneath, and marked along the side near the basal edge with three parallel impressed lines, of which the central one is the least conspicuous; it is keeled above for a short distance from the terminal mucous pore, is marked along the sides with divergent backward inclined impressed lines, and is reticulately wrinkled throughout. The mantle is minutely granular, with the respiratory slit a little in advance of the middle.

Length 19 millim., height 8 (in contraction); mantle 12 long. Shell 7 in length, 4 wide.

*Hab.* Cape York, North Australia.

Only a single specimen of this very interesting form was obtained. I have associated this species with the name of Dr. Paul Fischer, the eminent malacologist of the Jardin des Plantes.

TRIBONIOPHORUS GRAEFFEI, Humbert.

*Hab.* Sydney.

The species of this genus—*T. graeffei*, Humbert, *T. schüttelei* and *T. krefftii* of Keferstein—together with *Aneitia macdonaldii*, Gray, appear to bear externally a great resemblance one to another. If Macdonald's account of his *Aneiteum* slug be correct, then the

specimens from New Caledonia identified with it by Gray were wrongly determined, for on examining the horny jaw of some of these, they prove to be quite different from that represented by MacDonald (Ann. & Mag. Nat. Hist. ser. 2, vol. xviii. (1856) p. 38), but exactly like the figure given by Keferstein of *Triboniophorus krefftii*. The length and distinctness, or even the total absence of the central longitudinal groove, and those diverging obliquely from it, appear in a great measure due to the manner in which the animal contracts or distends its skin at the time of death. Among the eleven specimens from New Caledonia in the British Museum, this variation is clearly evident, some showing the furrows very strongly, others in a less degree, and in two instances they are totally wanting. *T. krefftii*, with its rugose skin and peculiar lingual dentition, appears clearly distinct from the other species, although all the described forms, including the *Aneitia*, have been considered (perhaps correctly) by Heynemann one and the same species.

**NERITINA SOUVERBIANA, Montrouzier.**

*Hab.* Flinders Passage, North Australia, in 7 fathoms.

This species, as far as at present known, does not inhabit fresh water. It has been previously recorded from Port Jackson and New Caledonia, and being marine may even have a wider range.

**NEW ZEALAND.**

Examples of five species of land and freshwater shells from Wairapa, Wellington, were presented to the Expedition by Mr. W. T. Locke Travers. They are:—*Latia neritoides*, Gray; *Helix coma*, Gray; *H. glabriscula*, Pfeiffer; and two species of *Helix* which are apparently undescribed.

**HELIX (THALASSIA) TRAVERSI. (Plate XXIII. figs. 16–16 b.)**

Shell depressed, subconoid, keeled, narrowly perforate, thin, corneous, somewhat glossy, ornamented with fine light red wavy and very oblique lines, which are invisible in certain positions and best seen when the specimen is held up to the light. In addition to these lines there are pale reddish spots beneath the suture. Whorls  $5\frac{1}{2}$ , rather slowly enlarging, a little convex, sculptured with fine arcuate oblique lines of growth, which are cut across by close-set minute spiral striæ, both on the upper and under surfaces; last whorl moderately sharply keeled, convex beneath, and painted with fine wavy more or less zigzag light red lines radiating from the perforation to the periphery. Aperture oblique, sublunate. Peristome thin, a little thickened, expanded and reflexed in the columellar region.

Greatest diameter  $11\frac{1}{2}$  millim., smallest 10, height  $7\frac{1}{2}$ .

This species must not be confused with *H. zelandica*, to which it is closely related. It is a larger shell, more narrowly perforate, and at once known by its minute spiral striæ.

## HELIX (PATULA) STOKESI. (Plate XXIII. figs. 17-17 b.)

Shell very depressed, moderately umbilicated, obtusely angled at the periphery, pale yellow, irregularly spotted and variegated with reddish subradiating markings above, and dotted and streaked beneath with a lighter tint. Whorls 6, the two apical smooth, glossy, the rest convex, separated by a deep suture, slowly increasing, sculptured with numerous arcuate radiating thread-like liræ; last whorl obtusely angled or shouldered above the middle, and much more finely lirate beneath than above. Aperture obliquely lunate. Peristome thin, very slightly reflexed near the umbilicus.

Greatest diameter  $7\frac{1}{2}$  millim., smallest  $6\frac{1}{2}$ , height 4.

This species very closely resembles *H. coma* of Gray, but is more narrowly umbilicated, just a trifle more finely lirate, and has the body-whorl roundly angulated above the middle.

## SANDWICH ISLANDS.

Only the three following species, two *Melania*s from Honolulu and a *Neritina* from Hilo on the east coast of Hawaii, were brought home by the expedition.

## 1. NERITINA CARIOSA, Gray.

The shell figured in Wood's Index Test. Suppl. pl. 8. f. 9, as *Nerita cariosa* is undoubtedly the species from the Sandwich Islands, and not the Mauritian *N. mauritii* as supposed by Von Martens (Conch.-Cab. ed. 2, Monogr. *Neritina*, p. 276). The type is still preserved in the British Museum, having formed part of the late Dr. Gray's private collection, which he a short time before his death presented to the Museum. It has the apex remarkably eroded, and but very little white speckling on the outer surface. Very little importance need be attached to the fact of its locality being given as Africa, for the next species but one, *N. smithii*, a well-known Indian form, is also stated to inhabit that locality.

## 2. MELANIA MAUIENSIS, Lea.

This species has now been recorded from three of these islands (Maui, Molakai, and Oahu), and in all probability it occurs on Hawaii, the largest of the group.

## 3. MELANIA NEWCOMBII, Lea?

I am rather uncertain whether the series of little shells from this locality really belong to this species. They are very slender, consist of about five moderately convex whorls (the apex being invariably broken away), which are coated with an earthy deposit, beneath which is a light olive-greenish epidermis. They are sculptured with a few spiral striæ, which become more or less obsolete upon the two last whorls except around the base of the last, where they are usually maintained. The length is 16 millim., width 5, and the aperture is 5 long and 3 wide.

## CANARY ISLANDS.

Examples of the following species of Helicidæ were collected at Teneriffe:—1. *Vitrina lamarchii*, Férussac; 2. *Zonites cellaria*, Müller; 3. *Helix malleata*, Férussac; 4. *H. adansoni*, Webb & Berthelot; 5. *H. lactea*, Müller; 6. *H. apicina*, Lamarck; 7. *H. circumscissa*, Shuttleworth; 8. *H. lenticula*, Férussac; 9. *H. fortunata*, Shuttleworth; 10. *H. pavid*a, Mousson; 11. *H. phalerata*, Webb & Berthelot; 12. *H. lancerottensis*, Webb & Berthelot; 13. *H. lineata*, Olivi; 14. *Bulinus tarnerianus* (junior?), Grasset.

Of the above species Nos. 2, 5, 6, 8, 12, 13 are not restricted to the Canaries, but range further north, either to North Africa or Europe. For a full account of these species and their distribution, reference should be made to the 'Testacea Atlantica' of Wollaston.

Besides the species already enumerated, two small examples of *Limax canariensis* of d'Orbigny were collected at this locality, agreeing in every particular with d'Orbigny's description excepting size, from which it is concluded that they are but half-grown, being about an inch in length in contraction.

## CAPE DE VERD ISLANDS.

Only two species of Helicidæ were collected at St. Vincent, namely *Helix advena*, Webb and Berthelot, and *H. bollei* of Albers.

## ASCENSION ISLAND.

The only land-shell met with, *Helix (Fruticicola) similaris* of Férussac, is almost cosmopolitan, and has previously been recorded from this locality. The unbanded variety appears to be more common than that with a peripheral brown zone, judging from the series of 240 specimens at hand.

## SOUTH AFRICA.

The following species were obtained in this district: *Limax gagates*, Draparnaud (?=*L. capensis*, Krauss), and *Helix aspersa*, Müller, from the Cape of Good Hope; also a young specimen of the latter from Sea Point near Cape Town, and *Helix afra*, Pfeiffer, from Simons Bay.

It will thus be seen that the first two of these species are well-known British and European forms, and doubtlessly have been introduced. The single specimen of *H. afra* differs from that described by Pfeiffer in having the perforation entirely closed by the expanded columellar callus. The lip also is quite thin, without any internal thickening, and even in the type itself this is very slight and some distance from the extreme margin, which, being the last-formed part of the shell, has not received so much internal callus.

## BERMUDA.

All the terrestrial mollusks obtained at this locality are well-known forms, but one, the common European *Limax gagates*, has not, I

believe, been previously recorded from this island. The other species are:—*Helix bermudensis*, Pfeiffer; *H. circumfirmata*, Redfield; *H. microdonta*, Deshayes; *H. vortex*, Pfeiffer; *Bulimus ventrosus*, Férussac; *Succinea bermudensis*, Pfeiffer; *Helicina convexa*, Pfeiffer; *Melampus gundlachi*, Pfeiffer.

#### ST. THOMAS, WEST INDIES.

The forms obtained at this island are unimportant and none are restricted to it in their distribution, being met with in other islands of the West-Indian group.

##### 1. BULIMULUS EXILIS, Gmelin.

This species is not restricted to this island, but has also been reported from Guadeloupe, Dominica, Barbuda, and Cayenne.

##### 2. STENOGYRA (SUBULINA) OCTONA, Chemnitz.

##### 3. HELICINA SUBFUSCA, Menke.

The two specimens under examination approach, although they are not quite so dark in colour, the variety  $\beta$  of Pfeiffer (Monogr. Pneumon. p. 35). It appears to have been found on other islands besides St. Thomas.

##### 4. MEGALOMASTOMA ANTILLARUM, Sowerby.

Other localities whence this species it said to have been obtained are the islands of St. Vincent and Tortola.

##### 5. PHYSA RIVALIS, Maton & Rackett.

A few small specimens from this locality apparently belong to this species. The shell figured by Sowerby (Conch. Icon. vol. xix. fig. 31) is very unlike the drawing, and probably is specifically distinct from *P. rivalis*. The authorship of this species is erroneously attributed by Sowerby (*l. c.*) to his father, whose figure does not at all coincide with that in the 'Conchologia Iconica,' and who moreover rightly gives a West-Indian locality.

##### 6. HYDROBIA AUBERIANA, d'Orbigny.

This species, described in Sagra's 'Histoire &c. de l'Isle de Cuba' (vol. ii. p. 8, pl. 7. f. 6-7) as a *Paludestrina*, has a very thin semi-transparent operculum of a roundly ovate form but rather pointed above. It is also found on the island of St. Croix.

#### KERGUELEN AND PRINCE EDWARD'S ISLAND.

*Helix* (*Patula*) *hookeri* of Reeve, the only land-shell at present known from Kerguelen, has not hitherto been recorded from the latter of the above localities. The specimens from Marion Islands are remarkable in being radiately striped with red, but, with the exception of this slight difference, correspond precisely with normal examples of the species.

## TRISTAN D'ACUNHA.

Until now the known land-mollusks from these islands consisted of the two species of *Balea* mentioned below. The discovery therefore of three additional terrestrial forms is particularly interesting, two of them, however, being also found elsewhere. The species are:—

1. *LIMAX CANARIENSIS*, d'Orbigny.

Several specimens from the above locality agree in all external characters with those from Teneriffe which I have identified with this species. As a rule they are reticulated and mottled on the back with black, but in one or two instances this colouring is almost entirely absent.

2. *LIMAX GAGATES*, Draparnaud.

A single specimen, in contraction three quarters of an inch in length, appears to agree externally in every respect with this well-known European form. It has also been recorded from the Azores, Madeira, St. Helena.

3. *HELIX (HYALINIA) EXULATA*. (Plate XXIII. figs. 18, 18b.)

Shell depressed, orbicular, thin, moderately widely and deeply umbilicated, semitransparent, pale yellowish horn-colour, glossy, sculptured with oblique curved lines of growth. Whorls 5, convex above, distinctly margined below the suture, rather rapidly enlarging, the last not descending in front. Spire very depressed, only a little raised above the body-whorl, terminating at the apex in a large nuclear volution which is scarcely at all elevated above the succeeding one. Aperture broadly lunate, slightly oblique; peristome thin, a very little thickened and expanded on the columellar side.

Greatest diameter  $7\frac{1}{2}$  millim., smallest  $6\frac{1}{3}$ , height 4.

*Hab.* Tristan d'Acunha.

Although several species from various parts of the world bear considerable resemblance to this little unpretending form, still none are apparently identical.

4. *BALEA (TRISTANIA) VENTRICOSA*, Gray.

*Balea ventricosa* (Leach MSS.), Gray, Zool. Journ. vol. i. p. 62, pl. vi. fig. B.

*Hab.* Inaccessible Island, Tristan d'Acunha, October 16, 1873.

This species has not, as far as I can ascertain, ever been fully characterized, the diagnosis of Gray, consisting of five words only, being totally inadequate.

It may be described as pupiform, pale olive-brown, narrowly rimate, sculptured with rather strong oblique lines of growth. The whorls are six and a half to seven in number, rather rapidly enlarging, convex, divided by a deep oblique suture. The spire has curved outlines, and terminates above in an obtuse rounded smooth apex. The aperture is rather large, and occupies somewhat less than a third of

the total length. The peristome is thin, narrowly reflexed on the left of the aperture, and rather broadly expanded in the umbilical region, and has the extremities, which converge but very slightly, connected by a thin callus spread over the whorl.

Length 8 millimetres; diameter  $3\frac{1}{2}$ ; length of aperture  $2\frac{1}{3}$ , width 2.

5. *BALEA (TRISTANIA) TRISTENSIS*, Gray.

*Balea tristensis* (Leach, MSS.), Gray, Zool. Journ. vol. i. p. 61, pl. vi. fig. A.

*Hab.* Tristan d'Acunha, October 15, 1873.

This species is more slender and longer than *B. ventricosa*, and has one and at times two additional whorls, which are more convex and more slowly enlarging. The characters of the sculpture, of the umbilicus, and aperture are very alike in both forms, the latter of course being shorter in proportion to the total length of the shell.

SOUTH AMERICA.

The few species collected on the mainland and adjacent islands are for the most part well known. It is curious to note that *Limax gagates*, which I have already recorded among the 'Challenger' collections from Bermuda, Tristan d'Acunha, and South Africa, is again found at the island of Juan Fernandez. On placing side by side the specimens from these four localities, I am unable to trace any external difference.

The species are the following:—

1. *H. (STEPSANODA) QUADRATA*, Férussac.

*Hab.* Juan Fernandez island.

All the specimens brought home by the 'Challenger' differ slightly from those in Cuming's collection identified by Dr. Pfeiffer as belonging to this species. They are a little more depressed, just a trifle more widely umbilicated, and have a somewhat smaller aperture.

2. *HELIX (STEPSANODA) SELKIRKI*. (Plate XXIII. figs. 19–196.)

Shell small, discoidal, deeply umbilicated, thin, pale, spotted above with red, irregularly streaked beneath with a lighter tint. Whorls 6–7, very narrow, tightly coiled, slowly increasing, convex, narrowly channelled at the suture, sculptured with close-set, hair-like lines of growth; last whorl a little spreading towards the aperture, where it exhibits a very faint depression or constriction near but a little above the middle; spire flattened, only the least raised above the body-whorl. Aperture oblique, irregularly lunate; peristome simple, thin. Diam. 4 millim.; height 2.

*Hab.* Island of Juan Fernandez.

This species is of the same size and general appearance as *H. essellata*, Muhlfeldt, from the same locality, and probably exists in collections intermingled with that form. It is, however, distin-

guishable in a few points. In the first place the whorls are not quite so closely coiled, the last is spirally constricted and broader near the aperture, the mouth, in consequence, being larger than in *H. tessellata*, and the umbilicus is more open, exhibiting more of the penultimate volution.

The species is named after Alexander Selkirk, immortalized by Defoe in his story of Robinson Crusoe.

3. *H. (AMPHIDOXIA) MARMORELLA*, Pfeiffer.

*Hab.* Island of Juan Fernandez.

4. *BULIMUS (BORUS) ROSACEUS*, King.

*Hab.* Valparaiso.

The single specimen appears to have been taken whilst in a state of torpidity, as the aperture is closed with a tough horny epiphragm which is as thick as the operculum of *Paludina*.

5. *BULIMUS (CORONA) MELANOSTOMA*, Swainson.

*Hab.* Bahia, Brazil.

6. *BULIMUS (LEPTOMERUS) TENUISSIMUS*, Férussac.

*Hab.* Bahia, Brazil.

7. *STENOGYRA (NOTHUS) BULIMOIDES*, Pfeiffer.

*Hab.* Island of Juan Fernandez.

8. *STENOGYRA (NOTHUS) SPLENDIDULA*, Anton.

*Hab.* Island of Juan Fernandez.

9. *TORNATELLINA TROCHIFORMIS*, Beck.

*Hab.* Juan Fernandez.

10. *TORNATELLINA BILAMELLATA*, Anton.

*Hab.* Juan Fernandez.

11. *SUCCINEA FALKLANDICA*. (Plate XXIII. figs. 20-206.)

Shell elongate, somewhat solid, arcuately striated; whorls  $4\frac{1}{2}$ , very convex, regularly increasing; aperture ovate, occupying rather more than half the length of the shell. Columella only slightly arcuate, reflexed, forming a minute umbilical rimation, united above to the extremity of the outer lip by a thin callosity.

Length  $15\frac{1}{2}$  millim., width  $8\frac{1}{2}$ ; aperture  $8\frac{1}{2}$  long, 5 broad.

*Hab.* From a hill near the lighthouse, Pembroke Point, Falkland Islands.

This species might almost be considered a large form of *S. oblonga*, Draparnaud, which it much resembles in the convexity of the whorls, depth of the suture, and the proportional length of spire and aperture.

12. *SUCCINEA FRAGILIS*, King.

*Hab.* Island of Juan Fernandez.





J. Smit lith.

Hanhart imp

1. CHLOROSPINGUS OCHRACEUS.  
2. SPERMOPHILA PAUPER.

## 13. SUCCINEA (OMALONYX) GAYANA, d'Orbigny.

*Hab.* Juan Fernandez.

## 14. LIMAX GAGATES, Draparnaud.

*Hab.* Juan Fernandez.

## 15. CHILINA PATAGONICA, Sowerby.

*Hab.* Gray Harbour, west coast of Patagonia.

This species in many instances appears to be destitute of the five transverse spotted bands (*vide* Proc. Zool. Soc. 1881, p. 845). The types described by Sowerby were also from Gray Harbour.

## EXPLANATION OF THE PLATES.

## PLATE XXII.

- Fig. 1, 1 a. *Athoracophorus virgatus*, p. 263.  
 2, 2 a. *Helix* (*Geotrochus*) *moseleyi*, p. 263.  
 3, 3 a. ——— *labillardieri*, p. 264.  
 4, 4 a. ——— (*Hemiplecta*) *infrastrata*, p. 264.  
 5, 5 a. ——— (?) *cartereti*, p. 265.  
 6, 6 a, 6 b. ——— (*Chloritis*) *dentrecasteauxi*, p. 265.  
 7. *Patula hartmanni*, p. 265.  
 8. *Cyclostoma infans*, p. 266.  
 9, 9 a. *Helicina ponsonbyi*, p. 266.  
 10, 10 a. *Pythia apiensis*, p. 268.  
 11, 11 a. *Melania apiensis*, p. 269.  
 12, 12 a. ——— *turbani*, p. 269.

## PLATE XXIII.

- Fig. 13, 13 a. *Melania ordinaria*, p. 270.  
 14, 14 a, 14 b. *Helix* (*Trochomorpha*) *latimarginata*, p. 271.  
 15, 15 a, 15 b, 15 c. *Parmacochlea fischeri*, p. 273.  
 16, 16 a, 16 b. *Helix* (*Thalassia*) *traversi*, p. 274.  
 17, 17 a, 17 b. ——— (*Patula*) *stokesi*, p. 275.  
 18, 18 a, 18 b. ——— (*Hyalinia*) *exulata*, p. 278.  
 19, 19 a, 19 b. ——— (*Stepsanoda*) *selkirkii*, p. 279.  
 20, 20 a, 20 b. *Succinea falklandica*, p. 280.

4. Deuxième liste des Oiseaux recueillis dans l'Ecuador occidental par MM. Stolzmann et Siemiradski. Par le Comte HANS DE BERLEPSCH, C.M.Z.S., et L. TACZANOWSKI, C.M.Z.S.

[Received May 5, 1884.]

(Plate XXIV.)

Les oiseaux de cette collection ont été recueillis dans les localités suivantes.

*Guayaquil*.—Climat chaud et sec; la contrée parsemée en partie de mimoses et de cactus, couverte en partie de forêts et de broussailles, qui perdent en entier leur verdure en été. Au sud de la ville s'étendent les manglars, couvrant les îlots de la rivière Guayas et l'île de

Puna. Les oiseaux caractéristiques pour cette localité sont :—*Myrmia micrura*, *Thamnophilus albinuchalis*, *Chrysomitris siemiradzkii*, *Picumnus sclateri*, et *Crypturus transfasciatus*.

Yaguachi, Chimbo (ou Puente de Chimbo, pour le distinguer du San Jose de Chimbo, dans la sierra, sur la route entre Guaranda et Podegas), Copatillo, Pedregal, Surupata, Cayandede, Chaguarpata, Tribulpata, Cerro de Margarita, Alpachaca, Cechce sont situés sur la route entre Guayaquil et Alausi, depuis 0 jusqu'à 10,000 pieds d'altitude. Bugnac, Yoyaxi, La Union (Llagos) et Sical se trouvent sur la route d'Alausi à Cuenca.

Yaguachi.—Au bord de la rivière du même nom, tributaire du côté gauche de la rivière Guayas. Climat un peu plus humide que celui de Guayaquil; végétation semblable, mais la faune un peu différente, on n'y voit plus d'espèces d'oiseaux cités plus haut, mais en revanche on y trouve le *Campylorhynchus balteatus*, *Picumnus olivaceus*, et *Thamnophilus transandeanus*.

Puente de Chimbo, d'où venait la plus grande partie des oiseaux de la liste précédente, est la dernière station du chemin de fer allant de Yaguachi (800 pieds) le long de rivière Chimbo. Forêt vierge, humide; la température s'y baisse la nuit jusqu'au 17° Centigrade. Oiseaux caractéristiques sont :—*Cephalopterus penduliger*, *Heliothrix barroti*, *Thalurania hypochlora*, *Picumnus olivaceus*, *Odontophorus erythrops*, et *Penelope orton*. Grande diversité de la faune dans les différentes saisons à cause des migrations des espèces de la côte pendant le dessèchement des forêts, p. e. *Helimaster albirissa*.

Copatillo (1000 pieds), Pedregal (2600 pieds).—Forêts chaudes, faunes mélangées comme à Chimbo et à Cayandede.

Cayandede (4500 pieds).—Forêt humide, température modérée, s'abaissant la nuit jusqu'au 12° C. Végétation différente de celle de Chimbo, les lianes y manquent presque complètement; en revanche commencent les fourrés de buissons dans la forêt; les arbres moins élevés, les fougères arborescentes remplacent les palmiers; les nectandres et les ficus prédominent. Oiseaux caractéristiques :—*Cynanthus cyanurus*, *Chamaepetes goudoti*, nombreux *Callistes*, la limite supérieure du domaine du *Myiobius stellatus*, *Cephalopterus penduliger*, et *Ramphocelus icteronotus*, l'inférieure du *Scytalopus magellanicus*, *Chloronerpes fumigatus* et des Buarremons vrais. Les excursions y ont été entreprises sur une grande surface verticale, en bas jusqu'à Surupata (3700 pieds), El Placer (2600 pieds) et Pedregal (2600 pieds) toutes les trois fermes; plus haut jusqu'à Chaguarpata (5800 pieds), Tribulpata (7000 pieds), localités inhabitées, forêts serranes, où on trouve les premières Lafresnays, les Metallures et la *Psittospiza riefferi*.

Alpachaca (10,000 pieds), dernières parties forestières et commencement de la puna; la température s'y baisse la nuit jusqu'au 6° C., souvent il y neige. Profusion des oiseaux mouches (*Diphlogana*, *Lesbia*, *Petasophora* et autres), voltigeant dans les broussailles à fleurs continuelles.

Alausi (7500 pieds).—Chef-lieu du canton de ce nom, situé au bord d'une vallée non boisée au pied d'Azuagu, au bord de la rivière

de ce nom, tributaire de la rivière Chancan, du système du Rio de Chimbo.

*Laguna de Ticksan* (9000 pieds), petit lac à 1½ lieue d'Alausi.

*Cechce* (9600 pieds), ferme (hacienda).—Sierra avec des parties forestières, des bouquets d'arbres et de broussailles. Les excursions s'étendaient jusqu'à 10,700 pieds dans les pâturages alpestres couverts de la *Stipa ichu*.

*Bugnac* (6000 pieds), dans la vallée chaude de la rivière Chancan, sur la route entre Alausi et Chunche. Contrée du type Quechua, semblable à celle de Callacate au Pérou. La *Tanagra darwini* y abonde.

*Yoyaxi* (9000 pieds), marais assez vaste au milieu de la forêt; climat froid comme à Alpachaca et Cechce, mais les forêts élevées y vont plus haut que dans les localités citées, où à 8000 pieds commencent les broussailles naines (des myrtes et des lauriers) au milieu desquels il y a des groupes d'arbres plus élevés.

*La Union* ou *Llagos* (9000 pieds).—Ferme située au voisinage de la ville Chunche (Province Asnay-Cuenca). Forêts vierges, élevées, froides, domaine du Tapir et de l'Ours. Oiseaux, absents à Cechce, *Cyanocorax turcosa* et *Penelope montagnii*.

Toutes ces localités sont situées sur le versant occidental des Cordillères.

#### TURPIDÆ.

##### \*1. CATHARUS FUSCATER (Laf.).

Quatre mâles et une femelle recueillis à Cayandede en janvier et février. Iris blanc.

##### 2. CATHARUS DRYAS (Gould).

Cinq mâles recueillis à Pedregal (2600 pieds), à Placer (2800 pieds) et à Cayandede en janvier et février. Iris brun foncé.

Tous ces oiseaux ainsi que ceux de Chimbo ont le jaune du dessous beaucoup plus vif que les oiseaux de Huambo (Pérou septentrional) recueillis en mars et en avril, et n'ont pas la gorge maculée de noir comme ces derniers; la couleur du dos est distinctement olivâtre, ce qui ne se voit pas dans les oiseaux péruviens. Tous ces exemplaires sont d'une taille un peu moins forte (l'aile pliée est de 86-90 mill., tandis que dans les oiseaux péruviens elle est de 97).

##### 3. TURDUS IGNOBILIS MACULIROSTRIS, Berl. et Tacz.

Deux mâles adultes d'El Placer (2800 pieds), recueillis le 27 et le 29 février.

Ces oiseaux présentent tous les caractères de la coloration semblables à ceux de Chimbo.

##### \*4. TURDUS SERRANUS, Tsch.

Un mâle et trois femelles de Cayandede et de Chaguarpata, recueillis entre le 20 janvier et le 18 février. Iris brun foncé.

L'unique mâle de cette collection est d'une taille moins forte que l'oiseau du Pérou central, et s'en distingue par le noir moins intense

et moins lustré en dessus, parfaitement mat en dessous. Il a la première remige distinctement plus longue, dépassant plus l'extrémité des grandes tectrices; la queue moins étagée; le bec plus long et plus élargi à la base, d'un rouge orangé. Longueur de l'aile 121, queue 111, bec 30, tarse 35, différence entre les rectrices externes et les médianes 11 mill., tandis que chez l'oiseau péruvien la longueur de l'aile est de 132, queue 117, bec 29, tarse 37, différence entre les rectrices externes et les médianes 17 mm.

#### TROGLODYTIDÆ.

##### 5. HENICORHINA HILARIS, Stolz. MS.

*H. prosthaleuca similis, sed differt pectore griseo lavato (nec niveo), abdominis lateribus totis latissime brunneo-rufis, abdomine medio albedo rufescente perfuso; plumis alulae spuriae rufescente vix marginalis; aliis obsolete transfasciatis.*

♂ et ♀ ad. Sommet de la tête brun, bordé des deux côtés d'une bande noire; dos roux brunâtre foncé, passant sur le croupion en roux plus vif et plus clair que celui de la *H. prosthaleuca*; côtés de la tête noirs, bordés en dessus d'une longue bande sourcilière blanche commençant aux narines et descendant jusqu'au bas des côtés du cou, la partie renfermée entre l'œil et les narines colorée légèrement d'ocreux; les joues et la région auriculaire maculés également comme dans les espèces voisines de taches longitudinales blanches en laissant une large bande d'un noir pur derrière l'œil, séparant le sourcil de cette maculature; gorge blanche lavée légèrement d'ocreux; toute la poitrine blanchâtre enduite de cendré grisâtre plus fortement sur les côtés qu'au milieu; les côtés de tout l'abdomen largement roux-brunâtre foncé; milieu gris blanchâtre lavé de roussâtre, passant plus ou moins au roux sur la région anale; sous-caudales d'un roux clair. Ailes d'un brun roussâtre extérieurement, à barbes externes des remiges transversées de bandes noirâtres beaucoup moins nettes, moins prononcées et moins larges que chez la *H. prosthaleuca*, sans rien de blanchâtre sur les primaries; les plumes de l'aile batarde bordées finement de roussâtre au lieu de blanc; barbe interne des remiges schistacée; sousalaires grises tachetées de blanchâtre. Queue brune rayée en travers de noir moins régulièrement que dans l'espèce citée. Bec aussi long mais moins fort que celui de la *H. prosthaleuca*, noirâtre; pattes brunes. Iris brun foncé.

♂. Longueur de l'aile 55, queue 29, bec 20, tarse 25 mm.

♀.       "       50       "   20       "   19       "   24       "

Cette forme diffère de l'oiseau de Chimbo, que nous avons nommé dans la liste précédente *H. leucophrys*, par la couleur de la poitrine non cendrée, le roux beaucoup plus répandu sur le dessous du corps et surtout beaucoup plus prolongé sur les côtés du haut de l'abdomen; il a le bec également long. Les oiseaux du Pérou septentrional (Huambo) sont identiques à ceux de Chimbo, mais l'oiseau du Pérou central diffère de tous les autres par le bec beaucoup plus court et

beaucoup moins élargi à la base, ainsi que par le manque complet de raies noires sur les remiges.

Huit mâles et une femelle de Cayanded, deux paires de Chaguar-pata (5700 pieds) et un mâle de Pedregal (2800 pieds), recueillis en janvier, février et mars.

\*6. *THRYOTHORUS EUOPHRY*, Scl.

Mâle adulte et une jeune femelle en mue de Cechce recueillis en mai, un jeune mâle de Cayanded tué le 16 janvier. Iris brun.

Ce jeune mâle diffère des adultes par le sommet de la tête d'un gris de souris; par le manque complet de taches noires sur la poitrine et le milieu de l'abdomen; par le fond de l'abdomen plus roussâtre, la tache postoculaire brune au lieu de noir; le bec moins long, pâle, à mandibule inférieure blanchâtre; une taille moins forte.

7. *THRYOTHORUS MYSTACALIS*, Scl.

Un mâle pris par Stolzmann à Cayanded, le 27 février.

8. *TROGLODYTES FURVUS* (Gm.).

Deux mâles recueillis par Stolzmann à Surupata en février et mars.

Identiques aux oiseaux péruviens (*T. audax*, Tsch.), et également distincts de ceux de Cayenne par le manque complet de raies foncées au dos, et par une taille moins forte. Ils nous paraissent être différents de l'oiseau de Guayaquil.

9. *TROGLODYTES SOLSTITIALIS*, Scl.

Une paire recueillie par Stolzmann à Cayanded le 16 janvier. Iris brun.

\*10. *CISTOTHORUS BRUNNEICEPS*, Salv. Ibis, 1881, p. 129, pl. iii. f. 1.

Une paire d'adultes et trois jeunes recueillis par Stolzmann à Cechce (10,000 pieds) en mai. Iris brun grisâtre foncé.

Distincts des oiseaux péruviens par le sommet de la tête d'un brun unicolore sans stries fauves, les plumes du croupion traversées de quelques raies noirâtres bien distinctes, la gorge lavée de fauve et non blanc pur comme chez les oiseaux cités, le blanc du milieu du ventre également coloré légèrement de fauve, tandis que chez l'oiseau cité il est pur et bien distinct du roux des flancs. La dimension est un peu moins forte dans l'oiseau de l'Ecuadeur occidental, l'aile est longue de 45 mm., tandis que les péruviens l'ont de 47. Le jeune en premier plumage ressemble en tout au jeune du *Cistothorus* péruvien, et présente la même longueur de l'aile. En général toutes ces formes des *Cistothorus* sont aussi alliées entre elles qu'elles ne doivent être distinguées que comme des races locales.

MOTACILLIDÆ.

\*11. *ANTHUS BOGOTENSIS*, Scl.

Deux mâles et une femelle de Cechce, pris par Stolzmann en avril et mai.

## MNIOTILTIDÆ.

12. *PARULA PITIAYUMI PACIFICA*, Berl.

Un mâle de Surupata (3700 pieds) et une femelle de Cayanded, recueillis en mars et en janvier. Iris brun foncé.

Ces oiseaux de l'envoi récent, ainsi que ceux de Chimbo, ont beaucoup moins de blanc sur les tectrices supérieures des ailes et les rectrices externes (le mâle de Surupata n'a presque point de cette couleur sur les ailes) que tous les exemplaires de l'orient que nous avons examiné. Les oiseaux de l'Écuadeur occidental présentent donc sous ce rapport une transition entre la vraie *P. pitiayumi* et la *P. inornata*, Baird, de l'Amérique centrale, ou plutôt la race de cette dernière de Veragua qui n'a qu'une seule bande blanche sur l'aile, tandis que la *P. inornata* de Guatemala n'en a point. L'oiseau de Tumbes (Pérou nord-occidental) a les deux raies transalaires bien marquées.

\*13. *DENDRÆCA BLACKBURNIÆ* (Gm.).

Deux oiseaux adultes de Cayanded, pris le 16 février et le 17 mars. Iris brun foncé.

Les premiers exemplaires furent observés dans cette localité le 15 février (*Siemiradzki*).

\*14. *BASILEUTERUS CORONATUS* (Tsch.).

Cinq oiseaux des deux sexes de Cayanded recueillis en janvier et mars, un mâle de Tribulpata (6500 pieds) pris en mars, et une femelle de Cechce d'avril.

Ces oiseaux sont d'une taille un peu moins forte que ceux du Pérou septentrional (aile plus courte de 4-5 mm.), les oiseaux du Pérou central sont encore un peu plus forts. Dans la coloration ils se distinguent des péruviens par la nuance du dos tirant au roussâtre, plus encore sur les ailes et la queue, en dessous la nuance rousse se manifeste aussi plus ou moins sur les souscaudales et les côtés du bas ventre ; le jaune de l'abdomen est aussi un peu plus fort.

15. *BASILEUTERUS FRASERI*, Scl. P. Z. S. 1883, p. 653, pl. lxi.

Un mâle recueilli par Stolzmann à Pedregal le 27 février.

\*16. *BASILEUTERUS TRISTRIATUS*, Tsch.

Trois mâles et deux femelles recueillis par Stolzmann en février à Cayanded, Pedregal (3000 pieds) et à Placer (2800 pieds).

Ces oiseaux diffèrent des péruviens par le jaune du dessous moins beau, la bande sourcilière d'une couleur plus sale, la gorge enduite d'ocreux pâle, une taille moins forte.

\*17. *BASILEUTERUS NIGRICRISTATUS* (Lafr.).

Deux mâles recueillis par Stolzmann à Cayanded et à Cechce en janvier et avril.

\*18. *SETOPHAGA BAIRDI*, Salv.

Une paire de Cechce recueillie par Stolzmann le 6 mai.

19. *SETOPHAGA VERTICALIS* (d'Orb. et Lafr.).

Deux mâles et une femelle recueillis par Stolzmann à Cayandede en janvier et février.

\*20. *GEOTHELYPIS SEMIFLAVA*, Scl.

Une femelle prise par Stolzmann à Placer (2800 pieds) le 30 janvier.

## VIREONIDÆ.

\*21. *VIREOSYLVA JOSEPHÆ*, Scl. P. Z. S. 1859 p. 173 (décrite de Pallatanga).

Quatre mâles recueillis à Pedregal et à Cayandede en janvier, février et mars, et un jeune sans étiquette. Iris brun très foncé.

## HIRUNDINIDÆ.

\*22. *ATTICORA MURINA*, Cass.

Un oiseau adulte sans indication de sexe et un jeune en mue, de Ticsan (7000-9000 pieds), recueillis en mai et en juin.

La description de *Hirundo cinerea*, Gm., n'est pas assez complète pour qu'elle puisse être appliquée à cette espèce. Elle se distingue de la péruvienne par la couleur du dessous distinctement plus foncée et le manque presque complet d'éclat vert sur les petites tectrices alaires.

## CÆREBIDÆ.

\*23. *DIGLOSSA ALBILATERALIS*, Lafr.

Dix mâles et quatre femelles de Cayandede, de Cechce et de Chaguarpata (5200 pieds), recueillis entre le 10 janvier et le 10 mai.

Ces oiseaux sont un peu plus petits (surtout à queue plus courte) que les oiseaux de Bogota dans la collection Berlepsch, mais sans aucune différence dans la coloration. La même remarque peut être appliquée aux oiseaux du Pérou, qui sont aussi d'une taille plus forte; la coloration du mâle est la même; mais les femelles de l'Écuadeur présentent une petite différence dans la couleur du dessous du corps, où le milieu du ventre est coloré distinctement de jaunâtre, le dessus du corps est plus olivâtre. Ces oiseaux sont cependant en plumage tout frais, tandis que les péruviens sont en plumage usé.

\*24. *DIGLOSSA ATERRIMA*, Lafr.

Trois mâles de Cechce, recueillis en avril et en mai.

\*25. *DIGLOSSA PERSONATA*, Fras.

Deux mâles de Chaguarpata pris en février et mars; deux mâles, une femelle et un mâle très jeune de Cayandede pris en janvier et février, un mâle de Tribulpata (8000 pieds) du 8 mars, et une femelle de Cechce prise en avril. Iris rouge, rouge cerise et carminé, gris chez le jeune.

Identiques aux oiseaux de Bogota dans la collection Berlepsch.

\*26. *CONIROSTRUM FRASERI*, Scl. P. Z. S. 1858, p. 752 (décrit de Cuenca).

Trois mâles et deux femelles de Cechce recueillis en avril et en mai.

\*27. *CONIROSTRUM ATROCYANEUM*, Lafr.

Un mâle de Cayanded et cinq femelles de Chaguarpata et de Pedregal, recueillis depuis janvier jusqu'en avril.

Ces oiseaux sont identiques à ceux de Pérou. Le type de Lafresnaye venait de Rio Napo. L'oiseau de Pallatanga de la collection Fraser, nommé dans la liste (P.Z.S. 1859, p. 138) *C. albifrons*, serait probablement le *C. atrocyaneum*.

#### TANAGRIDÆ.

\*28. *EUPHONIA NIGRICOLLIS* (Vieill.)

Deux jeunes mâles recueillis par Stolzmann à Cayanded dans la moitié de mars.

29. *EUPHONIA XANTHOGASTRA*, Sundev.

Trois mâles adultes, deux femelles et deux jeunes mâles recueillis à Cayanded et à Pedregal en janvier et février.

\*30. *EUPHONIA SATURATA*, Cab.

Un mâle adulte et un jeune prenant sa livrée d'adulte recueillis par Stolzmann à Surupata (3600-3700 pieds) en janvier et février.

Ces oiseaux ont le jaune du sommet de la tête un peu moins intense et le jaune roussâtre du ventre moins pur que dans l'oiseau de Tumbez; la couleur du dos et des ailes plus violette et moins bleue.

31. *CALLISTE AURULENTA*, Lafr.

Quatre mâles, trois jeunes et un oiseau sans indication de sexe recueillis à Cayanded en janvier, février et mars.

Ces oiseaux de l'Ecuadeur occidental ont les bordures des plumes dorsales, des tectrices alaires et des remiges secondaires d'un jaune d'or plus intense et plus rougeâtre que les oiseaux de Bogota, qui ont ces bordures plus jaunes ou même verdâtres; en revanche ils ont la couleur de la tête et du dessous moins intense et moins rougeâtre. Les dimensions sont les mêmes.

\*32. *CALLISTE RUFICERVIX*, Prev.

Trois paires d'oiseaux adultes de Cayanded (4000 pieds) recueillis en janvier, février et mars. Iris brun foncé.

Ces oiseaux s'accordent en général avec un exemplaire de Bogota de la collection Berlepsch; ils ont seulement les couleurs un peu plus vives, le bleu de ciel du corps plus pur et moins verdâtre; le bord supérieur des tectrices auriculaires d'un or roussâtre comme celui de l'occiput et non blanchâtre comme dans l'oiseau cité; la bande bleuâtre frontale moins large. Les ailes et la queue sont plus courtes, mais le bec paraît être plus long.

\*33. *CALLISTE NIGROVIRIDIS* (Lafr.).

Trois mâles, deux femelles et un jeune recueillis à Cayandede depuis le 31 janvier jusqu'au 28 février, et une femelle de Chaguar-pata (5700 pieds) du 23 février. Iris brun foncé.

Semblables aux oiseaux de Bogota, mais moins bleuâtres sur la tête, le croupion et la poitrine; un peu plus petits. La race péruvienne est considérablement plus forte.

\*34. *CALLISTE LUNIGERA*, Scl.

Trois mâles, trois femelles et deux oiseaux sans indication de sexe de Cayandede, recueillis depuis le 16 janvier jusqu'au 6 mars. Iris brun foncé ou de terre de Sienné.

\*35. *CALLISTE VENUSTA*, Scl.

Une femelle prise par Stolzmann à Cayandede le 10 février.

\*36. *PECILOTHRAUPIS LUNULATA* (DuBus.).

Trois mâles et deux femelles de Cechce recueillis entre le 28 avril et le 6 mai. Iris brun foncé.

Intermédiaires entre la *P. lunulata* de Bogota et la *P. atricrissa* de Quito. Un mâle du 2 mai a les sous-caudales terminées distinctement de bordures rouges, tandis que les autres individus n'en ont rien de rouge ou des légères indications de cette couleur. Les oiseaux de Quito ont toujours les sous-caudales noires en entier. Ceux de Bogota ont les plumes bordées plus largement de rouge que les oiseaux de Cechce. En outre il n'y a pas d'autre différence entre les oiseaux de ces trois localités.

\*37. *COMPSOCOMA SUMPTUOSA CYANOPTERA* (Cab.).

Un mâle et trois femelles de Cayandede et de Chaguar-pata, recueillis en janvier, février et mars. Iris brun foncé ou brun rougeâtre.

L'intensité du bleu aux bords des remiges varie un peu. Une femelle du 16 février l'a plus clair que les autres, d'un bleu de ciel. Il paraît que les oiseaux de Quito ont ce bleu un peu plus intense que la majorité des oiseaux de Cayandede.

\*38. *PIPRIDEA MELANONOTA VENEZUELENSIS* (Scl.).

Un mâle pris par Stolzmann à Cayandede le 16 mars. Iris rouge brunâtre.

Identique aux oiseaux péruviens.

\*39. *DUBUSIA TÆNIATA* (Boiss.).

Une paire de Cechce, recueillis par Stolzmann en avril et mai. Iris rouge cerise. Nos oiseaux sont d'une taille moins forte que l'exemplaire de la Colombie (Musée de Varsovie), ils ont l'aile longue de 89 mill., tandis que ce dernier l'a de 98, et se distinguent par le bleu du dos non violâtre; les taches bleues du sourcil et du front n'ont rien de violet et ne le prennent que très légèrement et dans une seule direction de la lumière. Tous les oiseaux du Musée Berlepsch pro-

venant de l'Ecuadeur et de la Nouvelle Grenade ont la taille rapprochée à nos oiseaux de Cechce, et aucun ne présente pas de bleu aussi foncé que celui du Musée de Varsovie.

\*40. *TANAGRA CYANOCEPHALA*, Lafr. et d'Orb.

Cinq mâles et trois femelles de Cayandede et Surupata depuis le 14 janvier jusqu'au 28 février. Iris brun foncé.

Ces oiseaux ont les tectrices souscaudales d'un vert olive, dans quelques-uns à bordures jaune verdâtres, plus ou moins prononcées. Chez la *T. auricrissa* de Bogota les souscaudales sont d'un jaune presque pur, le jaune des sousalaires est aussi plus intense, et le vert olive du dos plus brunâtre et plus jaunâtre que dans nos oiseaux. Ils sont parfaitement identiques aux oiseaux du Pérou central et septentrional, et présentent les mêmes variétés sous le rapport de la présence et du développement des bordures jaunes sur les souscaudales. L'oiseau de Medellin se distingue le plus, et surtout par la nuance des parties inférieures du corps beaucoup plus foncée que chez tous les autres.

41. *TANAGRA CANA*, Sws.

Un mâle et deux femelles de Cayandede, recueillis par Siemiradzki le 13 et 17 mars.

\*42. *TANAGRA DARWINI*, Bp.

Un mâle adulte et une femelle très jeune recueillis à Bugnac par Siemiradzki en juin.

43. *RAMPHOCÆLUS ICTERONOTUS*, Bp.

Deux mâles et une femelle recueillis par Siemiradzki à Cayandede et à Pinampunga en janvier et mars.

\*44. *NEMOSIA ORNATA*, Scl.

Trois paires de Cayandede, de Pedregal (2830 pieds) et de Bugnac (6400 pieds) recueillis en janvier, février, mars et mai. Iris brun foncé.

\*45. *CHLOROSPINGUS NIGRIFRONS* (Lawr.), Ibis, 1875, p. 384.

Un mâle de Cechce (10,000 pieds) pris par Stolzmann en avril.

Cet oiseau présente une très petite différence des oiseaux péruviens dans la coloration de la tête, dont le front est d'une couleur plus foncée, les côtés de la tête d'une couleur beaucoup plus foncée et presque uniforme, et la bande sourcilière plus blanche. Outre cela on ne voit aucune différence.

\*46. *CHLOROSPINGUS PHÆOCEPHALUS*, Scl. et Salv. P. Z. S. 1877, p. 521 (décret de Jina et de Chillanes).

Treize mâles adultes et une femelle de Surupata et de Cayandede recueillis en janvier, février et mars, et un jeune de Chimbo pris en septembre. Iris rouge de sang, palissant aussitôt après la mort de l'oiseau en couleur carnée ou rouge ocreux chez les autres; le jeune l'a brun grisâtre.

Le jeune ne se distingue des adultes que par le sommet de la tête, et ses côtés lavés distinctement d'olive, qui dans certaines directions de la lumière prend un ton presque semblable à celui du dos ; le gris sale de la gorge sans aucune trace d'ocreux ; et la bande pectorale d'un olive sale, semblable à celui des flancs.

\*47. *CHLOROSPINGUS OCHRACEUS*, sp. n. (Plate XXIV. fig. 1.)

*Ch. capite supra cum nucha fusco-cinereo, vitta superciliari via pallidior, lateribus capitis brunneis ; dorso ex olivaceo pallide brunneo, uropygio rufescentiore ; corpore subtus ochraceo badio, hypochondriis brunnescentibus, subcaudalibus intense rufis ; tectricibus alarum minoribus cinereis ; majoribus et mediis dorso concoloribus ; remigibus extus et cauda rufescentibus ; subalaribus ochraceis. Rostrum nigricanti-corneum ; pedes brunnei ; iris brunnea.*

♀ ad. Sommet de la tête d'un cendré foncé tirant très peu sur l'olivâtre, bordé des deux côtés d'une raie sourcilière d'une nuance un peu moins foncée à peine distincte, dont la partie antéoculaire est légèrement colorée d'ocreux ; le dos est d'un brun peu foncé tirant un peu sur l'olive, et passant au roussâtre sur la partie postérieure du croupion ; côtés de la tête bruns ; tout le dessous du corps d'un ocreux rougeâtre, plus pur et plus clair au bas de la gorge et sur le milieu de l'abdomen, enduit largement de brunâtre sur les flancs et la poitrine ; souscaudales d'un roux plus intense que le ventre. Petites tectrices alaires d'un cendré un peu bleuâtre, les autres de la couleur du dos ; remiges brunes, les primaries et les secondaires bordées largement à l'extérieur de brun olivâtre clair, tirant sur le roussâtre sur la moitié basale des pennes ; les tertiaires et la barbe externe des secondaires voisines d'une couleur semblable à celle du dos ; sous-alaires ocreuses ; bord interne des remiges fauve. Queue brun roussâtre tirant un peu sur l'olive. Bec corné noirâtre ; pattes brunes ; iris brun. Longueur de l'aile 77, queue 70, bec 19, tarse 20 mm.

Une autre femelle, probablement moins adulte, avec le sommet de la tête et les petites tectrices alaires non cendrés mais d'un olive un peu plus verdâtre que le dos, à la strie sourcilière plus distincte et tirant au jaune blanchâtre.

Forme voisine du *Ch. melanotis*, Scl., de Bogota, mais avec la région auriculaire brune au lieu de noire, dos brun olivâtre au lieu d'ardoisé ; queue et ailes brun roussâtres à l'extérieur au lieu d'olives ; milieu du ventre sans blanc et les souscaudales plus rousses.

Deux femelles tuées par Siemiradzki à Cayandedel et à Chaguar-pata, le 16 janvier et le 5 mars.

\*48. *BUARREMON ASSIMILIS*, Boiss.

Deux mâles de Cechce, du 5 et 12 mai, identiques aux oiseaux de Bogota et du Pérou septentrional.

\*49. *BUARREMON INORNATUS*, Scl. et Salv. Ibis 1879, p. 426.

Un mâle adulte recueilli par Siemiradzki à Cayandedel, le 17 janvier. Iris terre de sienne brûlée.

Le Musée de Varsovie possède un oiseau acquis du feu Verreaux, nommé par Jules Verreaux *B. brunneinuchus*, et étiqueté comme provenant du Mexique, semblable en tout à notre oiseau de l'Écuadeur, sans aucune trace de collier noir, mais qui s'en distingue par le brun du sommet de la tête plus sombre et sans bordure latérale, plus claire et plus vive, semblables à celle du *B. brunneinuchus*; l'olive du dos plus sombre sans aucune trace de vert jaunâtre sur la nuque. Les dimensions sont les mêmes.

\*50. *CARENOCHROUS SPODIONOTUS* (Scl. et Salv.), Ibis 1879, p. 425 (décrit de Guapulo, Calacali et Sical).

Deux mâles et une femelle de Cechce tués le 4 mai. Iris brun rougeâtre foncé.

Un de ces oiseaux, du Musée Berlepsch, a une petite tache jaune au commencement et au dessus des freins, qui sont noirs. Cette particularité se trouve quelquefois dans cette espèce, tandis que le *C. comptus* (Scl. et Salv.) a une tache frontale plus grosse et plus distincte. Le dernier a aussi la calotte rousse plus pâle et plus atténuée en arrière. (Voyez l'Ibis, l. c.)

#### 51. *CARENOCHROUS LEUCOPTERUS* (Jard.).

Cinq mâles et six femelles de Cayanded, de Cechce (10,000 pieds), de Surupata (3800 pieds) et un jeune en premier plumage de Bugnac (6400 pieds) recueillis en février, mars et mai. Iris brun rougeâtre.

Presque tous ont une tache noirâtre au front entre le blanc des freins, qui manque complètement chez un mâle de Cechce.

Le jeune en premier plumage se distingue des adultes par la couleur du dos tirant au brunâtre, le roux du sommet de la tête sale, le noir des côtés de la tête beaucoup moins foncé, la tache post-nasale moins nette, des grosses stries noirâtres sur la poitrine, les flancs d'un gris roussâtre au lieu de cendré, sous-caudales moins rousses, mandibule inférieure d'un jaune orangé.

#### \*52. *PSITTOSPIZA RIEFFERI* (Boiss.).

Une paire de Chaguarpata et de La Union (8700 pieds) de février et de juin. Iris roux (couleur des parties environnantes).

Identiques aux oiseaux de Bogota.

#### FRINGILLIDAE.

#### 53. *PHEUCTICUS CHRYSOGASTER* (Less.).

Deux mâles de Cechce (10,000 pieds) et de Bugnac (6000 pieds), et une femelle de Cayanded (7500 pieds), pris en février, avril et juin. Iris brun foncé. Ces oiseaux s'accordent en général avec les oiseaux de Quito (Musée Berlepsch); ils sont seulement un peu plus petits, surtout le bec est moins gros. Nous avons déjà indiqué la différence de la coloration entre les oiseaux de Quito et de Chimbo dans notre article précédent. Le mâle de Bugnac est coloré comme ceux de Quito; il paraît que la femelle de Cayanded diffère de celle de Chimbo en ce qu'elle a les taches noires du dos et des côtés de la

tête beaucoup plus larges et plus prononcées ; le dos supérieur est presque tout à fait noir. Si ces différences seraient constantes on pourrait séparer la forme des localités plus élevées comme une race locale.

54. *SPERMOPHILA GUTTURALIS OLIVACEA*, Stolz. m.

Sept mâles et une femelle de Cayandedel, recueillis depuis janvier jusqu'en février.

\*55. *SPERMOPHILA LUCTUOSA*, Lafr. et d'Orb.

Deux femelles recueillies par Stolzmann à Bugnac (6000 pieds) en mai.

56. *SPERMOPHILA PAUPER*, Stolz. m. (Plate XXIV. fig. 2.)

*S. obscura*, Tacz. P. Z. S. 1880, p. 199. Berl. et Tacz. P. Z. S., 1883, p. 550.

Trois mâles adultes de Cayandedel recueillis par Stolzmann, identiques aux oiseaux de Chimbo et du Pérou septentrional (Callacate) et non à la *Sp. obscura* du Pérou central. Cette forme se distingue de cette dernière par une taille moins forte, le bec plus robuste et plus large, les couleurs moins foncées et particulièrement en dessous, le blanc beaucoup plus répandu au milieu du ventre, la nuance roussâtre plus ou moins distincte sur les ailes. Les dimensions sont les suivantes :—

♂. Long. totale 121–125, vol 182, aile 51–53, queue 35–43, bec 9, tarse 15 mm.

♀. Long. totale 118, vol 171, aile 50–53, queue 37–38, bec 9, tarse 14 mm.

\*57. *CATAMENIA ANALOIDES*, Lafr.

Un mâle et deux femelles recueillis par Stolzmann à Cechce, Bugnac et sur la route d'Alausi à Bugnac (6500 pieds), en mai.

\*58. *CATAMENIA HOMOCHROA*, Scl. P. Z. S. 1858, p. 552 (décrit de Matos).

Sept mâles et trois femelles de Cechce recueillis en avril et mai. Les oiseaux du Pérou septentrional nommés par Taczanowski *C. inornata* sont identiques à ceux de Cechce ; ils ont les mêmes dimensions et les mêmes couleurs. La vraie *C. inornata* (Lafr.), dont un exemplaire Bolivien se trouve au Musée Berlepsch, est une forme très voisine, mais beaucoup plus grande. On ne voit aucune différence de coloration entre ces deux formes.

Les mâles de Cechce, aile  $66\frac{1}{2}$ , queue 58–60, bec 9–10, tarse  $20\frac{1}{2}$  mm.

„ de Cutervo, „  $66\frac{1}{2}$ , „ 61, „  $9\frac{1}{2}$ , „ 21 „

„ de Maraynioc, „ 72, „ 63, „ —, „ 21 „

*C. inornata* de la Bolivie, „  $77\frac{1}{2}$ , „ 68, „  $8\frac{3}{4}$ , „ 21 „

\*59. *CATAMBYRHYNCHUS DIADEMA* (Lafr.).

Trois mâles et deux femelles de Cayandedel et de Chaguarpata, recueillis en janvier, février et mars.

Identiques aux oiseaux péruviens ; la seule différence que présente l'unique mâle péruvien du Musée de Varsovie consiste dans la présence d'une bande rousse complète en travers du croupion, ce qui ne se voit sur les oiseaux de la Nouvelle Grénade et chez nos oiseaux de l'Ecuadeur occidental ; dans tous ces oiseaux la couleur rousse n'est visible que sur les côtés du croupion.

60. *VOLATINIA JACARINA SPLENDENS* (Vieill.).

Un mâle recueilli par Stolzmann à Placer (2800 pieds) le 30 janvier.

\*61. *PHRYGILUS ALAUDINUS* (Kittl.).

Un mâle pris par Stolzmann à Cechce le 4 mai. Iris brun foncé.

\*62. *PHRYGILUS PLEBEIUS*, Tsch.

Une femelle prise par Stolzmann à Alausi le 25 avril. Iris brun foncé.

63. *ZONOTRICHIA PILEATA* (Bodd.).

Un mâle pris par Stolzmann à Cechce le 1 mai.

\*64. *CHRYSOMITRIS CAPITALIS*, Cab.

Deux mâles de Cayandeled et de Cechce pris par Stolzmann en mars et mai.

L'oiseau de Cechce a les mêmes dimensions que les péruviens, mais l'autre exemplaire est plus petit, l'aile n'a que 61 mill. de longueur. L'oiseau de Cechce a une particularité curieuse en ce qu'il a le milieu de la gorge jaune.

\*65. *SYCALIS LUTEOLA* (Sparrm.).

Deux mâles recueillis par Stolzmann à Cechce dans les premiers jours de mai. Iris brun foncé.

ICTERIDÆ.

\*66. *OSTINOPS ATROCASTANEUS*, Cab. J. f. O. 1873, p. 309 (décrit de l'Ecuadeur).

Trois mâles recueillis à Pedregal en février. Iris brun foncé.

CORVIDÆ.

\*67. *CYANOCITTA TURCOSA*, Bp.

Deux oiseaux recueillis par Stolzmann à La Union (8700 pieds) en juin. Iris brun très foncé.

TYRANNIDÆ.

\*68. *OCHTHODIETA FUMIGATUS* (Boiss.).

Un mâle recueilli par Siemiradzki à La Union, en juin.  
Identique aux oiseaux de Bogota (Musée Berlepsch), il a seulement le bec un peu moins fort.

\*69. *OCHTHÆCA FUMICOLOR*, Scl.

Deux mâles de Cechce recueillis par Siemiradzki en avril et mai.  
Iris brun.

\*70. *OCHTHÆCA LESSONI*, Scl.

Quatre mâles et trois femelles recueillis à Cechce, à La Union (8700 pieds), Tribulpata (7000 pieds) et à Chaguarpata, depuis le mois de mars jusqu'en juin. Un oiseau de Bogota (Musée Berlepsch) n'en diffère que par le brun du dos plus roussâtre, et le roux de la poitrine et de la bande transalaire plus pâle. Un oiseau de Quito paraît être intermédiaire. Il paraît donc que ce ne sont que des différences individuelles.

\*71. *OCHTHÆCA GRATIOSA*, Scl., P. Z. S. 1862, p. 113 (décrite de l'Ecuadeur).

Deux mâles et une femelle de Chaguarpata, recueillis en janvier, février et mars.

Identiques à l'oiseau du Pérou septentrional et n'en sont distincts que par le brun du dos plus foncé, le jaune du front et du sourcil un peu plus vif; la bande rousse transalaire également distincte.

\*72. *MECOCERCULUS STICTOPTERUS* (Scl.).

Une paire recueillie par Stolzmann à Cechce en avril.

Distincts des oiseaux péruviens par la couleur du dos d'un olive brunâtre obscur au lieu d'olive verdâtre.

\*73. *MECOCERCULUS CALOPTERUS* (Scl.).

*Formicivora caloptera*, Scl. P. Z. S. 1859, p. 142 (décrite de Pallatanga).

*Serpophaga leucura*, Lawr. Ibis, 1875, p. 384, pl. ix. f. 2 (décrite de l'Ecuadeur).

Deux femelles de Cayanded recueillies le 18 et le 20 janvier.  
Iris brun foncé.

\*74. *MECOCERCULUS PÆCILOCERCUS* (Scl. et Salv.).

Une femelle recueillie par Stolzmann à Chaguarpata le 24 février.  
Iris brun foncé.

Exceptée une taille beaucoup moins forte, l'oiseau ressemble en tout aux péruviens.

\*75. *MUSCISAXICOLA MACULIROSTRIS* (d'Orb. et Lafr.).

Deux femelles recueillies par Stolzmann à Yocon (8600 pieds) le 17 mai. Iris brun foncé.

\*76. *PÆCILOTRICCUS*<sup>1</sup> *RUFIGENIS* (Scl. et Salv.).

*Todirostrum rufigene*, Scl. et Salv. P. Z. S. 1877, p. 522 (décrit de Mongi).

Deux mâles de Cayanded recueillis en janvier, février et mars.  
Iris rouge cerise très foncé.

<sup>1</sup> *PÆCILOTRICCUS*, g. nov., Berlepsch.

*Ποικίλος* = multicolor, *tricus* = nom. propr.

Species:—1 *P. ruficeps* (Kaup); 2 *P. rufigenis* (Scl. et Salv.).

77. *LOPHOTRICCUS SQUAMICRISTATUS* (Berl.).

Deux mâles et une femelle de Pedregal et de Surupata, pris en janvier, février et mars.

\*78. *ANÆRETES PARULUS ÆQUATORIALIS* (Lafr.).

Deux mâles recueillis par Siemiradzki à Cechce le 29 avril et le 4 mai. Iris blanchâtre.

Il paraît que les oiseaux de l'Ecuadeur, identiques à ceux du Pérou septentrional, se distinguent des oiseaux du Chili par les plumes noires allongées de la huppe moins longues, le front et la nuque moins variés de blanchâtre, gorge et la poitrine marquées de taches noirâtres beaucoup plus larges, le dos d'un brun moins rousâtre (plus olivâtre), bec plus court et un peu plus élargi à la base.

\*79. *MIONECTES STRIATICOLLIS* (d'Orb. et Lafr.).

Deux femelles de Surupata et de Chaguarpata recueillis en février.

80. *TYRANNISCUS CHRYSOPS* (Scl.).

Une paire et un jeune de Cayanded led recueillis en janvier et février.

\*81. *TYRANNISCUS UROPYGIALIS* (Lawr.), Ann. Lyc. N. H. New York, 1869, p. 266.

Deux mâles et une femelle de Cechce et de Cerro Margarita, recueillis par Stolzmann en avril. Iris brun foncé. Selon toutes les données il nous paraît que c'est un *Tyranniscus* et non *Mecocerculus*.

82. *ORNITHION SCLATERI*, Berl. et Tacz.

Une femelle de Cayanded prise par Stolzmann le 15 janvier.

\*83. *ELAINEA GRISEIGULARIS*, Scl., P. Z. S. 1858, p. 554, pl. cxlvi. f. 1.

Deux mâles et deux femelles pris par Stolzmann à Cechce et à Bugnac (5400 pieds) en mai.

Ces oiseaux se distinguent de la *E. modesta*, Tsch. (*E. albiceps* d'Orb.), du Pérou, par le blanc beaucoup moins développé sur la huppe interne, sans y former les cornes latérales foncées lorsque l'oiseau hérisse les plumes; les deux bandes transversales beaucoup plus régulières et mieux prononcées; pli de l'aile plus jaune; les flancs de l'abdomen lavés plus fortement de jaune; la couleur du dos plus foncée et tirant sur l'olivâtre. La taille est la même. Les oiseaux péruviens avec lesquels nos oiseaux ont été comparés ont été recueillis depuis novembre jusqu'en mars.

\*84. *MYIODYNASTES CHRYSOCEPHALUS*, Tsch.

Un mâle pris par Stolzmann à Surupata le 19 janvier. Iris brun foncé. Cet oiseau est d'une taille beaucoup moins forte que le mâle adulte du Pérou central, et s'en distingue par beaucoup de détails de la coloration, et principalement il a le devant du front fortement strié de blanc, tandis qu'il n'y a presque point de trace de cette couleur au front de l'oiseau péruvien; la huppe interne est orangée

au milieu, tandis qu'elle est toute limonacée dans l'oiseau péruvien ; le cendré de la nuque et du cou postérieur moins pur et lavé en grande partie d'olive ; l'olive du dos plus foncé et tirant au brunâtre ; les suscaudales entourées d'une bordure rousse ; en dessous le bas de la gorge plus fortement coloré d'ocreux ; les flammèches foncées pectorales beaucoup plus prononcées ; le jaune du reste beaucoup plus intense ; dans les ailes les tectrices et les remiges bordées plus fortement de roux à l'extérieur ; la bordure interne des remiges est d'un ocreux roussâtre, tandis qu'elle est jaune à peine lavée de fauve chez l'oiseau péruvien ; toutes les rectrices bordées finement à l'extérieur de roux, et plus largement au bord interne. Le bec est un peu plus élargi et moins atténué à l'extrémité.

La femelle du Pérou septentrional (Huambo) s'accorde en général avec l'oiseau du Pérou central, mais sous certains rapports elle est comme intermédiaire entre l'oiseau du Pérou central et celui de l'Ecuadeur, elle a beaucoup plus d'ocreux sur la gorge et le devant du cou, toutes les tectrices bordées des deux côtés de roux, mais beaucoup moins que chez l'oiseau de l'Ecuadeur.

♂ du Pérou central. Long. de l'aile 114, queue 97, bec 29, tarse 18 millim.

♀ du Pérou septentrional. Long. de l'aile 110, queue 92, bec 29, tarse 18 millim.

♂ de l'Ecuadeur occid. Long. de l'aile 97, queue 83, bec 29, tarse 17 millim.

**\*85. MYIOBIUS FLAVICANS, ScL., P. Z. S. 1860, p. 464.**

Six mâles et sept femelles de Cayandeled, Surupata (3800 pieds), Pedregal (2800 pieds), pris en janvier, février et mars.

**86. MYIOBIUS CRYPTERYTHRUS, ScL.**

Un mâle et deux femelles de Cayandeled du 12 mars et du 27 février.

**87. MYIOBIUS STELLATUS, Cab.**

Une paire de Cayandeled et de Pedregal pris par Stolzmann en janvier et en février.

**88. CONTOPUS ARDESIACUS (Laf.).**

Quatre mâles adultes, un jeune mâle et deux femelles de Cayandeled et de Bugnac, recueillis en janvier et février.

Identiques aux oiseaux du Pérou central et septentrional et de Venezuela (Musée Berlepsch) ; ce dernier a cependant les ailes un peu plus longues. Les oiseaux de l'Ecuadeur ont le milieu du bas ventre en général plus pâle et lavé de fauve.

**89. CONTOPUS RICHARDSONI (Sw.).**

Un mâle de Pedregal (2800 pieds) et un jeune en mue de Placer (2800 pieds) pris en janvier et en mars. Iris brun foncé.

**90. MYIARCHUS NIGRICEPS, ScL.**

Un mâle de Bugnac (6000 pieds) pris par Siemiradzki en juin.

91. *TYRANNUS MELANCHOLICUS*, Vieill.

Un mâle adulte de Cayanded pris par Siemiradzki le 22 janvier.

## COTINGIDÆ.

\*92. *PACHYRHAMPHUS VERSICOLOR* (Hartl.).

Un mâle et deux femelles de Cayanded recueillis en février et mars.

Ce mâle a la gorge et les côtés de la tête lavés plus fortement de jaune que les exemplaires de Bogota et d'Antioquia (Musée Berlepsch), il a aussi le dessous du corps plus lavé de jaunâtre et les raies noires très peu apparentes. Les femelles ont le jaune plus intense que les femelles péruviennes, à raies foncées beaucoup plus marquées, le roux beaucoup plus repandu sur les ailes. En outre les dimensions sont plus petites que dans les oiseaux de la Nouvelle Grénade et du Pérou. Il paraît donc qu'il faudra les distinguer comme une race locale.

\*93. *PIPREOLA JUCUNDA*, Scl., P. Z. S. 1860, p. 89, pl. clix. (décrit de Cachi-Llacta près de Nanegal).

Six mâles et une femelle de Cayanded (4500 pieds) recueillis en janvier et février. Iris jaune d'orange.

\*94. *HELIOCHERA RUBROCRISTATA* (d'Orb. et Lafr.).

Deux femelles de Cechce, prises en avril et mai. Iris rouge de cerise.

95. *CEPHALOPTERUS PENDULIGER*, Scl.

Une femelle d'El-Placer (2600 pieds) prise par Siemiradzki le 24 février.

Dépourvue en entier de l'appendice jugulaire si remarquable chez l'autre sexe.

## DENDROCOLAPTIDÆ.

\*96. *SYNALLAXIS FRONTALIS*, Pelz.

Cinq mâles, trois femelles et un jeune de Cayanded, de Chaguar-pata et de Cechce, recueillis en février, mars et avril.

Ces oiseaux sont intermédiaires entre le *S. frontalis* du Pérou central et le *S. fruticicola* du Pérou septentrional. Ils sont tous aussi largement blancs au milieu des parties inférieures du corps comme cette dernière espèce; la bande sourcilière est d'un gris cendré plus clair que la région auriculaire; deux femelles ont même la partie postoculaire de cette bande colorée de roussâtre, mais moins fortement que chez les *S. fruticicola*.

97. *SYNALLAXIS PUDICA*, Scl.

Un mâle recueilli par Siemiradzki à Cayanded (4000 pieds) le 19 février. Iris brun rougeâtre.

98. *SYNALLAXIS ERYTHROPS*, Scl.

Trois mâles et quatre femelles de Cayanded et de Pedregal, recueillis en janvier, février et mars. Iris brun rougeâtre.

\*99. *SYNALLAXIS WYATTI*, Scl. et Salv., P. Z. S. 1870, p. 841.

Trois mâles et deux femelles de Cechce (10,400–11,000 pieds) recueillis en mai et en juin.

Ces oiseaux ne diffèrent d'un exemplaire de la Nouvelle Grénade (Santa Martha) du Musée de Berlepsch que par le bec moins long et plus foncé, l'aile plus courte, les taches noires des parties supérieures du corps en général plus grosses et moins largement bordées d'une nuance grise et un peu différente; le dessous du corps plus ocreux à stries ocreuses sur le devant du cou et la poitrine plus nettement prononcées sur un fond tirant au grisâtre; dans la queue nos oiseaux ont sur la quatrième rectrice une grosse ligne rousse beaucoup plus marquée sur la barbe interne près de la baguette. Quant à la tache gulaire la couleur n'est pas constante; un mâle l'a d'un roux ferrugineux assez intense parsemé finement de noir par les extrémités de ces plumes, en général beaucoup plus petite que dans les autres individus; le deuxième mâle l'a d'un ocreux roussâtre beaucoup plus grande que le précédent, également parsemée de noir; le troisième mâle et la femelle l'ont d'un jaunâtre soyeux aussi pâle que celui de l'oiseau de la Nouvelle Grénade sans rien de noir au bout des plumes et sans bordure ocreuse en bas de cette tache, bien prononcée chez l'oiseau cité plus haut.

Un autre exemplaire provenant également de Santa Martha, de la collection de M. Sclater, présente les mêmes caractères différentiels dans la coloration, étant également en plumage frais, d'où vient que toutes les taches noires sont plus fines, et les bordures plus larges, mais il a le bec aussi court que tous nos oiseaux, l'aile au contraire un peu moins longue; le roussâtre de la tache gulaire intermédiaire entre celui des individus les plus pâles et celui qui l'a d'un ocreux roussâtre. Dimensions des oiseaux de l'Écuadeur:—

♂ Longr. de l'aile 66, queue 68–70, bec 23, tarse 25 mm.

♀ „ „ 65, „ 68, „ 21, „ 25 „

\*100. *PSEUDOCOLAPTES BOISSONNEAUTI* (Lafr.).

Une femelle de La Union (8700 pieds) pris par Stolzmann en juin.

\*101. *AUTOMOLUS HOLOSTICTUS STRIATIDORSUS*, Stolzmann. MS.

*A. holostictus valde affinis, sed corpore subtus rufescentiore, minus olivaceo; alis extus rufescentioribus; rectricibus angustioribus; tectricibus superioribus et inferioribus caudæ saturatius brunneo-castaneis; marginibus plumarum dorsi minus nigrescentibus et striis pallidis minus clare definitis; rostro, ut videtur, basi altiore vix distinguendus.*

♂. Long. de l'aile 86, queue 92, bec (culmen) 24, tarse 26 mm.

♀. „ „ 85½ „ 84, „ 24, „ 26 „

Très voisin de l'*A. holostictus*, Scl. et Salv., d'Antioquia (Musée Berlepsch), mais différent dans les détails indiqués dans notre diagnose. M. Sclater, qui a examiné les oiseaux de Siemiradzki, les croit identiques à son *A. holostictus*.

Deux mâles et une femelle de Cayanded et de Chaguarpata recueillis en février et janvier. Iris brun foncé.

\*102. *AUTOMOLUS IGNOBILIS*, Scl. et Salv. P. Z. S. 1879, p. 522 (décrit d'Antioquia).

Un mâle et trois femelles de Cayanded (4100 pieds) recueillis en février et mars. Iris brun foncé.

M. Sclater, qui a comparé un exemplaire de l'Ecuadeur du Musée Berlepsch, identique aux oiseaux de Cayanded, avec son type, n'a trouvé aucune différence.

103. *ANABAZENOPS TEMPORALIS* (Scl.).

Une jeune femelle de Pedregal recueillie par Siemiradzki le 29 janvier. Iris brun.

\*104. *ANABAZENOPS SUBALARIS* (Scl.), P. Z. S. 1859, p. 141 (décrit de Pallatanga).

Huit mâles et deux femelles de Cayanded, de Pedregal (2800 pieds), de Surupata et de Chaguarpata (5700 pieds), recueillis en janvier, février et mars. Iris brun foncé.

\*105. *MARGARORNIS PERLATA* (Less.).

*M. squamigera*, auctt., nec d'Orb. et Lafr. (voyez 'Ibis,' 1874, p. 323).

Un mâle adulte de Chaguarpata recueilli par Siemiradzki le 24 janvier. Iris brun.

Le cannelle ou chatain du dessus du corps est plus intense, la gorge et les taches du dessous plus lavés de jaune que chez les oiseaux de Bogota. Il serait peut-être utile de séparer les oiseaux de l'Ecuadeur occid. comme une race locale.

106. *MARGARORNIS BRUNNESCENS*, Scl.

Une paire et un oiseau sans indication de sexe de Cayanded recueillis en janvier.

Identiques aux oiseaux de Chimbo, et présentent les mêmes différences des oiseaux de la Nouvelle Grénade. Les oiseaux péruviens (Huambo) ont la queue plus longue que ceux de l'Ecuadeur, et les taches du dessous en général plus grosses.

107. *GLYPHORHYNCHUS CUNEATUS CASTELNAUDI* (DesMurs).

Trois mâles et deux femelles de Cayanded et de Pedregal (2600 pieds) recueillis en janvier et février. Iris brun foncé.

Identiques aux oiseaux de Chimbo. Ils diffèrent des oiseaux de Yurimaguas, recueillis également en janvier et février, par le bec plus court et plus large au bout, la nuance du dessous plus foncée, le roux de la gorge plus pâle et le cou antérieur et la poitrine plus fortement tachetés. Ces oiseaux de l'Ecuadeur ont en général la queue plus ou moins fortement usée à l'extrémité, tandis qu'elle est intacte dans les péruviens. Les oiseaux de Cayenne ont le bec aussi long et presque de la même forme que ceux de Yurimaguas, mais

s'en distinguent par le fond du dessous presque de la même nuance que celui des oiseaux de l'Ecuadeur et non olivâtre comme dans les oiseaux de Yurimaguas avec des stries claires prolongées le long du milieu du ventre jusqu'aux sous-caudales.

\*108. *DENDROCOLAPTES VALIDUS*, Tsch.

Un mâle recueilli par Siemiradzki à Cayandede le 19 janvier. Iris brun foncé.

Cet individu est jeune, et diffère beaucoup de l'oiseau de Bogota par la coloration en général plus obscure; le roux de la queue et des ailes plus foncé, les stries de la tête différentes; le bec plus large à la base et d'une couleur plus pâle.

Cet oiseau est d'une taille moins forte que ceux du Pérou central, à bec de la même forme et également élargi à la base; la couleur générale est plus foncée, surtout la queue présente une grande différence sous ce rapport; les stries fauves du dos sont distinctement plus larges, les raies brunes sur cette partie beaucoup moins développées et réduites à des taches courtes disposées sur les deux côtés de la strie médiane; les stries du sommet de la tête sont d'une autre forme, c'est-à-dire qu'elles sont presque également larges dans toute leur longueur, tandis qu'elles sont très fines chez l'oiseau péruvien et fort élargies à l'extrémité.

Long. de l'aile 130, queue 115, bec 45, tarse 29 mm. (ois. de Cayandede).

Long. de l'aile 140, queue 140, bec 45, tarse 28 mm. (ois. de Monterico).

Les oiseaux du Pérou et de l'Ecuadeur ont été tués presque à la même époque de l'année, les premiers le 19 décembre, le dernier 19 janvier. Celui de l'Ecuadeur a l'extrémité des rectrices médianes fort usée.

L'oiseau d'Antioquia recueilli par Salmon présente une différence beaucoup plus importante. Il a le bec beaucoup plus court et moins élargi; les raies du dos presque effacées, les raies du dessous plus fines.

Long. de l'aile 134, queue 122, bec 40 mm.

\*109. *PICOLAPTES LACRYMIGER* WARSZEWIEZI (Cab. et Hein.).

Quatre mâles de Cayandede recueillis en janvier. Iris brun foncé.

Ces oiseaux de l'Ecuadeur ressemblent à ceux du Pérou et ne s'en distinguent que par la couleur des parties supérieures du corps plus rousse, sans rien d'olive qui se manifeste plus ou moins chez les oiseaux péruviens.

FORMICARIIDÆ.

\*110. *THAMNOPHILUS UNICOLOR* (Scl.).

*Dysithamnus unicolor*, Scl. P. Z. S. 1859, p. 141 (décrit de Palatanga).

Quatre mâles adultes et deux femelles de Cayandede et de Surupata recueillis en janvier, février et mars. Iris brun foncé.

PROC. ZOOL. SOC.—1884, No. XXI.

21

L'oiseau typique de la collection de M. Sclater, examiné par Berlepsch, est identique en tout à nos oiseaux. M. Sclater est aussi actuellement d'avis que c'est un *Thamnophilus* et non *Dysithamnus*.

111. *DYSITHAMNUS SEMICINEREUS*, Scl.

Un mâle moins adulte que celui de Chimbo recueilli par Stolzmann le 23 janvier. Iris brun foncé.

112. *MYRMOTHERULA MENETRIESI* (d'Orb.).

Un mâle adulte pris par Stolzmann à Surupata le 27 janvier.

\*113. *FORMICIVORA CAUDATA*, Scl.

Cinq mâles, cinq femelles et deux jeunes de Cayanded, Chaguar-pata, et Surupata, recueillis en février et mars. Iris brun foncé.

114. *PYRIGLENA PICEA*, Cab.

Mâle adulte recueilli par Stolzmann à Cayanded le 24 janvier. Iris rouge cramoisi.

Identique aux oiseaux péruviens.

\*115. *GRALLARIA RUFICAPILLA*, Lafr.

Deux mâles de Cayanded et de Cechce, recueillis en janvier et mai. Iris brun foncé.

L'oiseau de Stolzmann a le roux de la tête moins foncé que les oiseaux d'Antioquia et de Medellin du Musée de Varsovie, et passant graduellement en olive du dos; le roux des côtés de la tête plus pâle; le blanc du dessous lavé de jaunâtre et non pur comme dans les oiseaux cités; les taches foncées des côtés de l'abdomen ont moins de noir et manquent en entier sur le milieu de la poitrine et de l'abdomen. L'oiseau est un peu moins fort, à bec distinctement plus long.

L'exemplaire de Siemiradzki et deux autres oiseaux du Musée de Berlepsch, recueillis dans l'Ecuadeur par Buckley, ont les couleurs du dessus (le roux de la tête et le brun olive du dos) plus obscurs qu'un oiseau de Bogota. Les premiers ont aussi les plumes du milieu de la poitrine moins bordées de brun et de roux, le fond du dessous d'un blanc plus pur. Le dernier a aussi l'ongle du doigt postérieur plus court.

\*116. *GRALLARIA REGULUS*, Scl. et Salv.

Un mâle de Pedregal (2600 pieds) recueilli par Stolzmann le 27 février. Iris brun foncé.

La femelle du Pérou septentrional (Tambillo) se distingue de notre oiseau par la présence du blanc sur le collier, de grosses taches noires sur le milieu de la poitrine et des petites sur le milieu de l'abdomen, le milieu de l'abdomen d'un roux beaucoup plus pâle, le fond du dos plus brunâtre, une taille moins forte.

\*117. *GRALLARIA MONTICOLA*, Lafr.

Huit mâles, deux femelles, et un jeune en premier plumage de

Cechce jusqu'à 10,000 pieds, recueillis en avril et mai. Iris brun très foncé.

Identiques à l'oiseau de Quito au Musée Berlepsch.

\*118. *GRALLARIA RUFULA*, Lafr.

Une paire de Cechce (10,000 pieds), recueillie par Stolzmann le 10 mai. Iris brun très foncé.

#### PTEROPTOCHIDÆ.

\*119. *SCYTALOPUS MAGELLANICUS* (Lath.).

Trois mâles adultes et une femelle de Chaguarpata (5700 pieds) et de Cechce. Iris brun foncé.

Identiques aux oiseaux de Cutervo.

#### TROCHILIDÆ.

\*120. *PHAETHORNIS SYRMATOPHORUS*, Gould.

Un mâle de Cayanded, recueilli par Stolzmann le 20 janvier.

\*121. *LAFRESNAYA GAYI* (Bourc. et Muls.).

Deux mâles et deux femelles de Cayanded et de Chaguarpata, recueillis en janvier, avril et mai.

\*122. *PETASOPHORA ANAIS* (Less.).

Trois mâles adultes de Cechce et d'Alausi (7650 pieds), recueillis en avril et mai.

\*123. *PETASOPHORA CYANOTIS* (Bourc.).

Un mâle et deux femelles de Cayanded et de Cechce, recueillis par Stolzmann en mars et avril.

\*124. *PHÆOLEMA ÆQUATORIALIS*, Gould.

Huit mâles et trois femelles recueillis à Cayanded en janvier, février, avril et mai.

Les femelles manquent de prase jugulaire, elles ont la gorge blanchâtre maculée de vert doré; la queue plus courte que celle du mâle.

\*125. *ERIOCNEMIS LUCIANI* (Bourc.).

Un mâle et quatre femelles de Cechce, recueillis en avril et en mai.

\*126. *HELIOTRYPHA VIOLA* (Gould).

Mâle et femelle de Cechce et de La Union (5700 pieds), recueillis en mai et juin.

\*127. *DIPHLOGÆNA HESPERUS*, Gould.

Treize mâles adultes, une femelle et trois jeunes mâles de Cechce et de Alpachaca (10,500 pieds), recueillis en avril et en mai.

♀. La femelle se distingue du mâle d'une manière analogue à celle des deux autres espèces; les plumes du sommet de la tête sont

courtes, moins polies et forment une surface comme squamuleuse d'une couleur semblable à celle du mâle, mais distinctement moins brillante, et presque uniforme depuis le front jusqu'à la nuque, c'est-à-dire qu'elle est plus rouge sur cette dernière que chez le mâle; la raie médiane bleue est plus claire et non saphirée, presque aussi large que celle du mâle et ne dépassant pas l'angle postérieur de l'œil, il lui manque donc la partie élargie sur le cervix propre à l'autre sexe; dans les autres directions de la lumière ce bleu passe en violet. Le vert des parties inférieures du corps est distinctement plus clair que chez le mâle, mais également étincillant, même plus fortement sur l'abdomen; la base de toutes ces plumes est plus claire que chez le mâle, et en conséquence tout le dessous paraît être plus distinctement squamuleux; elle n'a aucune trace de la gemme jugulaire; le bronzé du dos moins uniforme, passant au vert sur les côtés. Le reste est comme chez le mâle. Les mâles non adultes se distinguent par le sommet de la tête couvert en entier de plumes aussi courtes que celles de la femelle d'un bronzé cuivreux obscur, à éclat métallique faible non étincillant, ou faiblement devant les yeux dans des rares directions de la lumière; le reste est comme chez les adultes; les uns ont la gemme jugulaire violette aussi bien développée que chez les adultes; les autres n'en ont point.

Il y a aussi un mâle à sommet de la tête paré d'une manière la plus brillante et la plus complète et sans gemme jugulaire, qui n'est représentée que par une plume unique verte en partie et violette sur le reste.

**\*128. PANOPLITES MATHEWSI (Bourc.).**

Un mâle et deux femelles de Cayandeled, recueillis en février et mars.

**\*129. DOCIMASTES ENSIFERUS SCHLIEPHACKEI (Heine).**

Deux mâles adultes et une femelle de Cechce, recueillis par Stolzmann en avril et mai.

**\*130. BOURCIERIA FULGIDIGULA, Gould.**

Six mâles et six femelles de Cayandeled et de Tribulpata (7000 pieds), recueillis en janvier, février et mars.

**131. HELIODOXA JAMESONI (Bourc.).**

Un mâle de Placer (2800 pieds), recueillis par Stolzmann le 23 janvier.

**132. LAMPROPYGIA WILSONI (Del. et Bourc.).**

Deux paires de Cayandeled et de Pedregal, recueillis en janvier et février.

**\*133. AGLÆACTIS CUPREIPENNIS (Bourc. et Muls.).**

Mâle et deux femelles, recueillis à Cerro Margarita et à Cechce en avril.

\*134. *METALLURA TYRIANTHINA* (Bourc.).

Quatre mâles et deux femelles de Chaguarpata (7000 pieds) et de Cechce, recueillis en janvier, février et avril.

Ces oiseaux s'accordent en tout à ceux de Bogota, ils ont seulement le dessous du corps un peu plus lavé de roussâtre. Les oiseaux de Quito sont plus grands, surtout le bec, et ont la queue plus dorée; c'est le *M. tyrianthina quitensis* (Gould).

\*135. *RAMPHOMICRON MICRORHYNCHUM* (Boiss.).

Un jeune mâle commençant à prendre l'habit d'adulte, recueilli par Stolzmann à Cechce le 6 mai.

\*136. *ADELOMYIA MELANOGENYS MACULATA* (Gould).

Un mâle et trois femelles de Cayanded et un jeune mâle de Chaguarpata (5800 pieds), recueillis en janvier, février et mars.

En général ils ressemblent aux oiseaux de Bogota, mais ils ont la moitié basale de la barbe interne des rectrices latérales plus longuement blanc roussâtre clair et cette couleur mieux tranchée de la partie foncée. Il paraît aussi que dans cette race les taches gulaires sont plus grandes et plus prononcées, les flancs moins roussâtres, et le bec un peu plus long. Ils s'accordent aussi dans les mêmes détails avec les oiseaux péruviens.

\*137. *SCHISTES PERSONATUS*, Gould.

Quatre mâles de Pedregal et de Cayanded, recueillis par Stolzmann en janvier et février.

138. *CYNANTHUS CYANURUS CÆLESTIS* (Gould).

Sept mâles adultes, deux jeunes mâles et cinq femelles de Cayanded, recueillis en janvier et février.

\*139. *LESBIA AMARYLLIS* (Bourc.).

Cinq mâles et deux femelles de Cechce et d'Alausi, recueillis en avril et mai.

Identiques aux oiseaux de Quito (Musée Berlepsch), si ce n'est qu'ils ont les tectrices supérieures de la queue lavées de cuivreux doré au lieu d'améthyste violet, le vert du dos plus pur, moins doré et le bec un peu plus long.

Un mâle de Bogota (Musée Berlepsch) a la queue beaucoup moins longue que tous les oiseaux de l'Ecuadeur, mais en outre il ressemble en tout aux oiseaux de Quito. Si cette différence dans la queue serait constante on pourrait séparer la *L. amaryllis* de l'Ecuadeur comme une race locale.

\*140. *LESBIA GOULDI GRACILIS* (Gould).

Un mâle et trois femelles de Cechce, recueillis en mai.

\*141. *STEGANURA MELANANTHERA* (Jardine).

Sept mâles et six femelles recueillis à Cayanded et à Pinyampunga et Surupata, en janvier, février et mars.

Identiques aux oiseaux de Quito excepté qu'ils ont l'aile un peu plus longue et le vert de la gorge du mâle plus bleuâtre et plus terne, le front moins cuivreux. La forme et la couleur des palettes caudales varie beaucoup, dans les uns elles sont d'un beau bleu violet, dans les autres d'un bleu verdâtre.

\*142. *ACESTRURA MULSANTI* (Bourc.).

Jeune mâle commençant à prendre sa livrée d'adulte, pris par Stolzmann à Alausi le 24 avril.

143. *CHÆTOCERCUS BOMBUS*, Gould.

Deux paires d'oiseaux adultes de Cayanded, prises en février et mars.

\*144. *MYRTIS FANNY* (Less.).

Deux mâles et une femelle pris par Stolzmann en mai à Bugnac (6400 pieds).

Cette femelle, incontestable selon Stolzmann, a sur un des côtés de la région jugulaire une plume squamiforme d'un bleu aussi brillant que celles du mâle.

145. *JULIAMYIA FELICIANA* (Less.).

Mâle adulte pris par Stolzmann à Bugnac le 28 mai.

146. *AMAZILIA RIEFFERI JUCUNDA*, Heine.

Six mâles et deux femelles de Cayanded et de Pinampungu, recueillis en janvier, février et mars.

147. *CHLOROSTILBON MELANORHYNCHUM*, Gould.

Un jeune mâle pris par Stolzmann à Cayanded le 15 janvier.

CAPRIMULGIDÆ.

\*148. *LUROCALIS RUFIVENTRIS*, Tacz. Ornith. du Pérou, i. p. 209.

Une paire recueillie par Siemiradzski à Cayanded le 25 janvier.

Oiseaux identiques aux péruviens. Le mâle adulte se distingue de la femelle typique par les taches des parties supérieures du corps d'un roux moins foncé, la présence de quelques grosses taches blanches sur la nuque et le haut du cou postérieur couvertes pour la plupart par le brun noir de l'extrémité des plumes; les taches rousses du bas de la poitrine plus larges, transformées en raies transversales irrégulières; le roux du ventre un peu plus clair; les raies noires aux sous-caudales postérieures un peu plus larges; les extrémités des rectrices submédianes d'un roux ocreux au lieu de blanc; la remige externe sans aucunes taches sur les deux barbes; la seconde très faiblement tachetée. Longueur de l'aile 220 mm.

149. *NYCTIDROMUS ALBICOLLIS* (Gm.).

- Un mâle de Cayanded, pris par Stolzmann le 12 janvier. Iris presque noir.

## PICIDÆ.

150. *CAMPEPHILUS SCLATERI* (Malh.).

Un mâle de Cayandeded recueilli par Stolzmann en février.

\*151. *CAMPEPHILUS POLLENS* (Bp.).

Deux paires de Cayandeded et de Chaguarpata, recueillies en janvier et février. Iris jaune.

Ils diffèrent des oiseaux de Bogota (Musée Berlepsch) par les ailes et la queue plus courtes, le bec plus long. En coloration il n'y a rien de particulier.

\*152. *CHLORONERPES FUMIGATUS* (d'Orb. et Lafr.).

Un mâle et deux femelles de Cayandeded et de El Placer (2800 pieds) pris en janvier et mars. Iris terre de Sienne brulée ou brun foncé.

\*153. *CHLORONERPES MALHERBII*, Schl.

Trois mâles et une femelle de Cechce (10,000 pieds) pris en avril, mai et juin. Iris brun foncé.

\*154. *HYPOXANTHUS RIVOLII BREVIROSTRIS* (Tacz.).

Une femelle de Cayandeded, recueillie par Siemiradzki en janvier. Iris brun rougeâtre.

Les oiseaux de l'Ecuador paraissent être intermédiaires entre le vrai *H. rivolii* de Bogota et le vrai *H. brevirostris* péruvien. Ils ont le bec plus long que ceux du Pérou, mais ils s'en accordent par la dimension des ailes et de la queue et par la coloration. M. Du Bois a dernièrement nommé l'oiseau de l'Ecuador *H. æquatorialis*, ce qui doit être rangé comme synonyme du *H. brevirostris*.

## TROGONIDÆ.

\*155. *TROGON PERSONATUS PROPINQUUS* (Cab. et Hein.), Mus. Hein. iv. p. 175.

Deux mâles de Cayandeded et de Chaguarpata (5700 pieds) et une femelle de Cayandeded, pris en janvier et février. Iris brun foncé chez le mâle, rouge cerise chez la femelle.

Cette forme du *T. personatus* ne diffère de la forme typique de Bogota que par les dimensions un peu moins fortes, et plus sensiblement par le bec plus large et plus long. Le *T. heliothrix* du Pérou central a les mêmes proportions que le *T. propinquus*, et n'en diffère que par une nuance plus ou moins bleuâtre des parties supérieures du corps, de la poitrine et des rectrices médianes, le bec un peu plus comprimé et moins gros. Toutes ces races sont très proches entre elles.

156. *TROGON VIRGINALIS*, Cab. et Hein.

Deux mâles et une femelle de Pedregal (2800 pieds), recueillis en janvier et février.

\*157. *PHAROMACRUS AURICEPS HELIACTIN* (Cab. et Hein.), Mus. Hein. iv. p. 207.

Un mâle et une jeune femelle de Cayandeded (5000 pieds), pris en février. Iris du mâle brun foncé, gris de la femelle.

Comme ce mâle n'est pas complètement adulte et n'a qu'une partie de plumes fraîches sur la tête, on ne peut pas estimer la différence complète qu'il peut présenter des oiseaux péruviens ; il paraît cependant de ce qu'il y a que les plumes de la tête sont dorées, et non d'un doré cuivreux fort intense propre aux oiseaux du Pérou ; le doré des plumes du dos et des tectrices alaires est aussi plus faible. Les ailes dans cet oiseau de l'Équateur sont moins longues de 8 millimètres ; en revanche le bec est beaucoup plus fort.

\*158. *PHAROMACRUS ANTISIENSIS* (d'Orb.).

Deux mâles et une femelle de Cayandeded recueillis en février. Iris rouge cerise.

Le mâle s'accorde en tout avec l'oiseau de Bogota du Musée Berlepsch, si ce n'est qu'il est un peu plus petit, et a le vert moins pur. Un oiseau de Sarayacu (Ecuador) recueilli par Buckley, et se trouvant au Musée Berlepsch, est encore plus petit et diffère essentiellement par un beau éclat cuivreux sur tout le vert du plumage, surtout sur la tête. Il possède aussi une bande sourcilière d'un cuivreux améthyste, manquant chez les autres oiseaux. Le dernier s'accorde le mieux avec la description de d'Orbigny, mais il faudra peut-être séparer l'oiseau de l'Équateur occidental et de Bogota comme une race locale.

#### CUCULIDÆ.

159. *PIAYA CAYANA MESURA* (Cab. et Hein.)?

Un mâle de Surupata recueilli par Siemiradzki en janvier. Iris rouge cerise.

Paraît être identique à l'oiseau de Bogota ; l'oiseau de Sta Lucia (Pérou septentrional) s'en accorde en tout.

#### RAMPHASTIDÆ.

\*160. *ANDIGENA LAMINIROSTRIS*, Gould.

Deux mâles et deux femelles de Chaguarpata (5800 pieds) et de Cayandeded, pris en janvier et février. Iris brun rougeâtre et brun autour de la pupille ; pattes d'un vert olive. Les femelles ont le bec d'un tiers plus court que les mâles.

\*161. *AULACORHAMPHUS HÆMATOPYGIUS*, Gould.

Trois mâles et une femelle de Pedregal et de Cayandeded, pris en janvier et février. Iris terre de Sienna brûlée.

Ces oiseaux diffèrent des deux exemplaires de Bogota (Musée Berlepsch) par le bec moins long et la mandibule supérieure enduite seulement de brun rougeâtre dans sa moitié latérale, tandis que dans les oiseaux de Bogota les côtés sont rouges jusqu'au bout. Il y a une strie bleuâtre au dessus de l'œil chez les individus de Bogota

qui manque chez les oiseaux de l'Ecuadeur. Les derniers ont la poitrine plus fortement lavée de bleuâtre, sont généralement plus obscurs et moins forts dans toutes les dimensions.

#### PSITTACIDÆ.

##### \*162. PIONUS CORALLINUS, Bp.

Deux mâles et une femelle recueillis par Stolzmann à Pedregal en février. Iris brun foncé.

##### \*163. PIONUS SENILOIDES (Mass. et Souancé).

Une femelle tuée par Stolzmann à Cayendeled en février. Iris brun foncé.

#### STRIGIDÆ.

##### \*164. BUBO NIGRESCENS, Berl.

*B. virginiano ex America sept. et centr. proximus, sed differt colore supra subtusque nigrescentiore, minus rufescente, plumarum basibus ardesiacis (nec fulvis), tarsis fere unicoloribus sordide albis (nec fulvis fusco fasciatis), maculis albis apicalibus tectricum alarum superiorum fasciisque externis scapularium fere pure albis.*

Tout le dessus du corps d'un brun noirâtre, varié de petites macules irrégulières d'un fauve pâle ou blanchâtre, disposées en bandes séparées (deux ou trois de chaque côté de la plume); la base des plumes en dessus et en dessous du corps est d'un ardoisé noirâtre (largement d'un fauve roussâtre chez le *virginianus*). Sommet de la tête presque uniforme sans maculature; les huppées également noirâtres avec une faible maculature ou une bordure blanchâtre au bord interne des plumes; les plumes basales du bec, la partie antérieure des tectrices auriculaires, le menton et une grande région jugulaire d'un blanc pur; les plumes des freins ont les baguettes noires, et quelques-unes au voisinage de l'œil sont noires en entier; la région oculaire et sourcilière mélangée de noirâtre et d'un blanc roussâtre; tectrices auriculaires antérieures terminées largement d'une bordure noire formant un croissant noir très distinct sur chacun des côtés de la tête; les tectrices postérieures mélangées de blanc et de noirâtre. Gorge bordée en dessous d'une bande étroite de plumes obscures avec une maculature fauve; les côtés du cou, le bord supérieur et les côtés de la poitrine ont la même coloration que le dos; sur la poitrine inférieure les raies blanches sont plus grosses et plus distinctes, formant des bandes régulières sur les plumes; ces bandes blanches deviennent sur l'abdomen encore plus larges, de sorte qu'on pourrait nommer les plumes blanches rayées régulièrement de bandes noirâtres (5-7 sur chaque plume, plus étroites que les intervalles blanchâtres, séparées du noirâtre par une ligne fauve); la région anale, les flancs internes et les sous-caudales variés d'une manière semblable au ventre, mais d'une teinte générale plus roussâtre. Les plumes des tibias d'un fauve blanchâtre avec une petite maculature obscure peu visible; les plumes du tarse d'un

blanc sale uniforme, sans taches. Remiges et rectrices d'un brun noirâtre comme le dos, traversées de bandes d'un brun grisâtre mélangé de roussâtre et de blanchâtre, ondulé et moucheté de noirâtre. Sur la barbe interne des remiges et des rectrices, excepté les deux médianes, ces bandes sont plus larges, et d'une couleur fauve presque en entier mélangée de noirâtre. Les rectrices terminées largement à peu près sur 18-20 millimètres, d'un blanc roussâtre presque uniforme, excepté les deux médianes, qui ont l'extrémité mélangée de blanc et de noirâtre; il y a 6 bandes claires sur les rectrices qui paraissent être d'un blanc roussâtre uniforme sur la page inférieure et y présentent la même largeur que les bandes noirâtres. Tectrices supérieures de la queue noirâtres barrées et ondulées irrégulièrement de blanc roussâtre. Les petites tectrices supérieures de l'avant bras sont d'un noirâtre peu varié de roussâtre; celles des remiges primaires et de l'aile batarde noirâtres avec une ou deux larges bandes d'un fauve clair sur la barbe interne; les moyennes et les grandes noirâtres mélangés de blanc roussâtre, les antérieures présentant une grosse tache d'un blanc presque pur sur l'extrémité de la barbe externe, mouchetée un peu de noirâtre en arrière; les scapulaires externes ont aussi quelques taches blanchâtres, mais variés plus de roussâtre en dehors; les sous-alaires antérieures barrées de noirâtre et de fauve, les postérieures blanches mélangées de noirâtre. Trois bandes claires sur la page inférieure de la première remige. Bec noirâtre, à extrémité pâle; iris jaune.

Long. totale 460, aile 350, queue 185, bec (culmen) 30½, tarse 80 mm.

Une femelle de Cechce (10,000 pieds) prise par Siemiradzki en juillet.

Au premier coup d'œil on est tenté de prendre cet oiseau pour une variété nègre, comme on a souvent des exemples dans la classe des rapaces; mais comme M. Sharpe, dans le Catalogue des Striges (p. 23), parle d'un oiseau pareil, provenant aussi de l'Équateur, du Musée Salvin et Godman, nous nous croyons être justifiés de l'opinion que cette curieuse coloration peut être constante et propre à une forme de *Bubo* habitant les montagnes de l'Équateur occidental, et non encore reconnue.

\*165. *MICRASTUR GUERRILLA*, Cass.

Une femelle de Surupata prise par Siemiradzki le 24 janvier. Iris brun grisâtre; parties nues de la tête et pattes jaunes.

Long. de l'aile 172, queue 165, bec (culmen) 17½, tarse 58 mm.

Le doigt externe sensiblement plus long que l'interne.

Cet oiseau diffère de deux oiseaux adultes du *M. guerilla*, provenant de Guatemala (Musée Berlepsch), par le plumage généralement plus obscur. Tête, dos et les ailes à l'extérieur sont d'un ardoisé brunâtre uniforme, tandis que chez les oiseaux de Guatemala le dos et la tête sont d'un ardoisé un peu plus clair, les ailes d'un brun chocolat un peu roussâtre. En dessous la différence est encore plus frappante, car les raies noirâtres sont plus larges et plus rapprochées entre elles, les blanchâtres plus étroites et fines sur la poitrine, ce

qui fait que tout le dessous du corps a une apparence beaucoup plus foncée. La gorge est d'un brun assez sombre (plombé clair chez le *M. guerilla*). Il n'y a que des traces faibles de deux bandes blanchâtres sur les rectrices médianes au lieu de trois bien prononcées de *M. guerilla*. On ne voit pas de différence dans les dimensions, mais le bec de l'oiseau de Surupata est un peu plus long.

Cet oiseau de Surupata pourrait aussi appartenir au *M. pelzelni*, Ridgw. ('Ibis,' 1876), décrit du Pérou oriental, car il a la queue plus courte que l'aile et n'a que deux bandes peu distinctes sur les rectrices, ce qui constitue les caractères distinctifs indiqués par M. Ridgway entre le *M. pelzelni* et le *guerilla*. Quant à la longueur de la queue, il faut remarquer que les deux oiseaux adultes de Guatemala (Musée Berlepsch) ont aussi la queue plus courte que l'aile, et qu'un troisième jeune de la même localité l'a de la même longueur que l'aile.

*M. guerilla* de Guatemala.

	Aile.	Queue.	Bec (culmen).	Tarso.
	mm.	mm.	mm.	mm.
Oiseau adulte . . . . .	177	160	16 $\frac{1}{2}$	59
" " . . . . .	162	148	15 $\frac{1}{2}$	58
" jeune . . . . .	160	160	14 $\frac{1}{2}$	60

COLUMBIDÆ.

\*166. COLUMBA ALBILINEA, Gr.

Une femelle recueillie par Siemiradzki à Bugnac.

167. ZENAIDA MACULATA (Vieill.).

Deux mâles de Cechce recueillis en mai.

\*168. METRIOPELIA MELANOPTERA (Molina).

Un mâle recueilli par Siemiradzki à Cechce le 1 mai.

Coloration plus obscure et plus brunâtre que chez les oiseaux du Pérou méridional et de Chili au Musée Berlepsch.

\*169. LEPTOPTILA VERREAUXI, Bp.

Mâle adulte de Pedregal et un jeune mâle de Cayanded, recueillis en février. Iris jaune orangé.

Diffèrent un peu des oiseaux de l'Amérique centrale par les couleurs généralement plus obscures, et les sous-caudales bordées d'une nuance brunâtre, la couleur du dessous des ailes d'un roux plus foncé.

Des oiseaux du Pérou septentrional il diffère aussi par la couleur des parties supérieures du corps et des ailes tirant un peu au brunâtre; tout le dessous du corps lavé plus fortement de rose; l'éclat rosé beaucoup plus fort sur la nuque et le cou postérieur, le rose commençant sur le vertex vis-à-vis de l'angle antérieur des yeux; couleur rosée et non roussâtre sur les côtés du cervix et de la nuque;

le roux du dessous des ailes plus intense et tirant au rougeâtre; les sous-caudales bordées de brunâtre.

\*170. *GEOTRYGON BOURCIERI*, Bp.

Un mâle recueilli par Stolzmann à La Union en janvier.

CRACIDÆ.

\*171. *PENELOPE MONTAGNII*, Bp.

Une paire d'adultes recueillie par Siemiradzki à La Union (8700-9000 pieds) en juin et juillet.

\*172. *CHAMÆPETES GOUDOTI* (Less.).

Quatre mâles et deux femelles de Cayandeded recueillis en janvier et février. Iris rouge de cerise dans le mâle, brun rougeâtre dans la femelle; parties nues de la tête d'un bleu outremer vif dans le mâle, d'un noir ferrugineux dans la femelle; paupières inférieures carnées; pattes rouges.

Nos oiseaux en plumage tout frais dont la mue n'est pas encore achevée, ne se distinguent de l'individu de Bogota (Musée de Varsovie) que par la nuance roussâtre réduite à la gorge seule, sans être prolongée sur les côtés de la tête et du cou postérieur comme cela a lieu chez l'oiseau cité; le roux du dessous paraît être un peu plus rougeâtre, ne commençant pas aussi haut sur le bas de la région jugulaire. La troisième remige primaire est beaucoup moins atténuée dans ces oiseaux de l'Écuadeur, ce qui ne se voit qu'au bout même.

	Aile.	Queue.	Bec.	Tarse.	
	mm.	mm.	mm.	mm.	
♂ ....	240	240	38	62	} de Cayandeded.
♂ ....	250	220	35	65	
♀ ....	230	230	35	65	
? ....	240	237	38	60	de Bogota.
♂ ....	263	280	—	62	{ de Govinda, Ecuador (coll. Buckley).

Ce dernier sera probablement identique au *Ch. tschudii*, Tacz., du Pérou septentrional.

\*173. *CRYPTURUS TRANSFASCIATUS*, ScL. & Salv. P. Z. S. 1878, p. 141, pl. xiii. (décrit de Sta Rosa, Ecuador).

Une paire de Guayaquil recueillie en août. Iris rougeâtre.

\*174. *NOTHOPROCTA CURVIROSTRIS*, ScL. & Salv. Nomencl. Av. Neotr. p. 163 (décrit de Calacali et Puellaro).

Une paire de Cechce (10,400 pieds) recueillie en avril et mai. Iris brun foncé.

## RALLIDÆ.

## \*175. RALLUS VIRGINIANUS, L.

Mâle adulte de Yoyacsi tué par Stolzmann en juin à 9000 pieds d'altitude. Iris brun rougeâtre.

## \*176. PORZANA CAROLINA (L.).

Une paire recueillie par Stolzmann à Cayandede en février.

## SCOLOPACIDÆ.

## \*177. GALLINAGO NOBILIS, ScL.

Deux mâles et une femelle adultes et un jeune mâle recueillis à Yoyacsi (9000-9100 pieds) en juin. Iris presque noir.

Comparés avec deux oiseaux de Bogota (Musée de Varsovie) et on ne voit pas aucune différence.

Toutes les espèces non fournies dans l'envoi précédent sont marquées par un astérique, comme il y en a 127 de pareilles dans cette liste, le nombre d'espèces recueillis par nos voyageurs est de 341.

NOTES SUPPLÉMENTAIRES À NOTRE PREMIÈRE LISTE DES  
OISEAUX DE L'ÉCUADEUR OCCIDENTAL.

## 1. HYLOPHILUS MINOR, Stolzmann. P. Z. S. 1883, p. 542.

L'oiseau de la collection de M. Sclater, recueilli par Fraser à Bubahayo et nommé par M. Sclater *Hylophilus* sp.?, et *H. aurantii-frons*?, a été examiné par Berlepsch. C'est un jeune de notre *H. minor*.

## 2. PHENICOTHAUPIS STOLZMANNI, nobis, P. Z. S. 1883, p. 546.

M. Salvin en examinant la femelle recueillie par Siemiradzki était de l'opinion qu'elle appartenait au *Ch. olivacea* (Cass.) d'Antioquia et du Rio Truando (voyez Biolog. Centr.-Am., Aves, p. 298).

Nous avons déjà expliqué qu'il n'y a pas de différence entre les deux sexes de l'oiseau recueilli par Stolzmann et Siemiradzki, tandis que tous les individus du *Ch. olivacea* connus, et que M. Salvin croit être mâles, ont la gorge, les freins, tour de l'œil et une partie des sous-alaires jaunes. On ne voit rien de pareil chez nos oiseaux des deux sexes, qui paraissent constituer une bonne espèce.

## 3. CHRYSOMITRIS SIEMIRADZKII, nob. P. Z. S. 1883, p. 551, pl. 1.

M. Sclater reconnaît nos oiseaux pour une excellente espèce, et dit qu'il ne possède dans sa collection qu'une femelle de Cuenca (Fraser). Les oiseaux de Pallatanga nommés dans la liste de M. Sclater *Ch. icterica* appartiendront probablement au *Ch. capitalis*, Cab.

5. A List of the Rhopalocera collected by Mr. G. French Angas in the Island of Dominica. By F. D. GODMAN and O. SALVIN.

[Received April 4, 1884.]

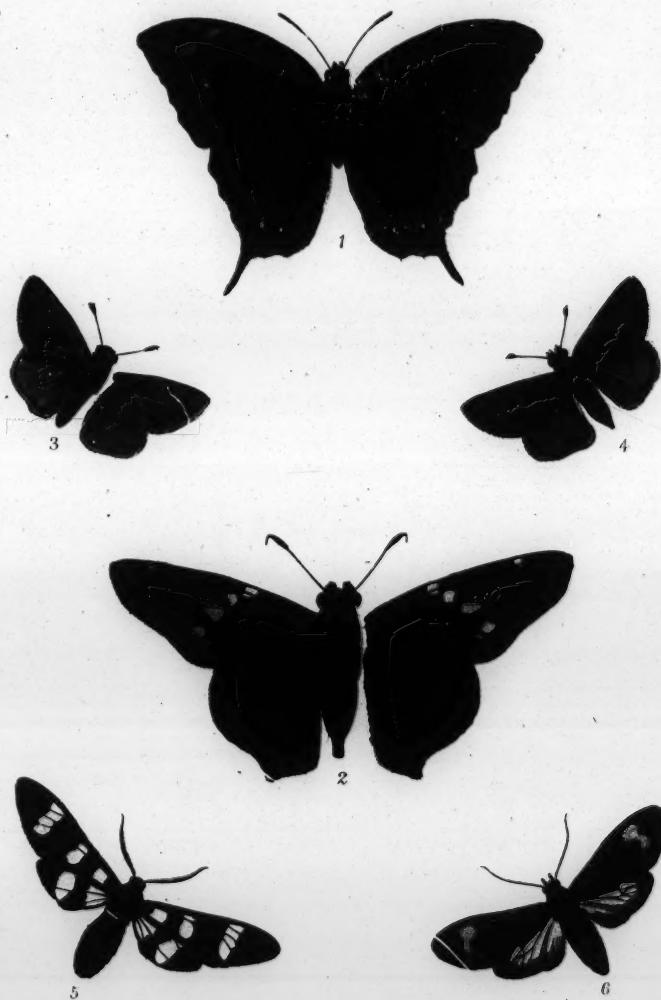
(Plate XXV.)

Our knowledge of the Lepidoptera of the West-Indian Islands is very imperfect, and, if we except the island of Cuba, nothing like a systematic attempt has ever been made to get together the fragmentary records on this subject which are scattered throughout zoological literature. It is true that lists like the present have been published of collections made in San Domingo and Puerto Rico, but these, for want of more ample materials, fail to give anything like a complete account of the Butterflies and Moths found in either of these islands.

Enough, however, has been done to show in some measure the character of the Lepidoptera of the Antilles, the chief peculiarities of which lie in the total absence of some of the most characteristic groups of the Neotropical fauna. Of the Nymphalidæ, the Danainæ are fairly represented so far as the genus *Danaïs* is concerned, but the *Ithomiæ* are restricted to three or four species in the larger islands. Of Satyrinæ there are hardly any (in the present collection none at all). The Brassolinæ are wholly absent, so also are the Morphinæ. The Heliconinæ are represented by *H. charithonia* and one or two species of *Eueides*. The Nymphalinæ proper alone in this family maintain the peculiarity of the fauna, and in this subfamily there are a few peculiar genera and several very fine species. Of the Erycinidæ, of which there are perhaps a thousand species on the mainland of South America, not a single one has yet been discovered on any of the Antilles. The Lycænidæ are represented by some common species of *Lycæna* and a very few species of *Thecla*. The Pierinæ in so poor a fauna are fairly numerous, and amongst them are some peculiar species. The Papilioninæ, for the small number of species, are remarkable for their peculiarity and beauty—indeed *Papilio homerus* of Jamaica is a most marked species even in this wonderful genus. Finally, the Hesperidæ, besides including several species of very wide range, also embrace a good many peculiar species, but all of more or less extensive genera.

The number of species in Mr. Angas's collection is 27, which are distributed amongst the families of Rhopalocera as follows:—

Nymphalidæ.	
Danainæ .....	1
Nymphalinæ .....	7
Lycænidæ .....	3
Papilionidæ.	
Pierinæ .....	5
Papilioninæ .....	1
Hesperidæ .....	10



W. Purkiss lith.

Hanhart imp.

LEPIDOPTERA FROM DOMINICA



One species of *Nymphalinae* is apparently new, and belongs to the Antillean section of the genus *Anaea*, of which there is a species in Cuba and another in San Domingo.

*Pieris virginia* alone of the *Pierinae* has any claims to peculiarity: it has been several times noticed in the Antilles, but the islands not specified, with the exception of Cuba, where we rather doubt its existence.

*Papilio neodamas* is in the same category as *Pieris virginia*, and is probably only found in the Windward Islands.

Of the *Hesperidæ* it is difficult to speak with certainty. Two species, both described in this paper, have probably the same range as the *Papilio* and *Pieris*.

In conclusion, we may say that we still look for considerable additions to the present list; and these may fairly be expected to include peculiar species of *Nymphalidæ* and *Hesperidæ*, and perhaps of *Papilionidæ*. The widely ranging forms, such as frequent the more open country, are probably most of them included in the following list. It is in the forests and in the older vegetation that novelties must be sought.

#### 1. *DANAIS PLEXIPPUS*.

*Papilio plexippus*, Linn. Syst. Nat. i. p. 767

*Danais plexippus*, Godm. & Salv. Biol. Centr.-Am., Rhop. i. p. 1.

This *Danais* appears to be common in Dominica, as there are many specimens in Mr. Angas's collection. These all belong to the form prevalent in the northern parts of South America, in which the spots in the apical portion of the primaries are purer white than in North-American examples.

#### 2. *COLÆNIS CILLENE*.

*Papilio cillene*, Cram. Pap. Ex. t. 215 f. D, E.

We have already stated (Biol. Centr.-Am., Rhop. i. p. 168) that the Cuban species of this *Colænis* conforms best to Cramer's figure, though his specimen is stated to come from Surinam! The examples in the present collection differ from the typical form of *C. cillene* in that the transverse band of the primaries beyond the cell is rather more strongly developed.

This is apparently a common species in the island.

#### 3. *AGRAULIS VANILLÆ*.

*Papilio vanillæ*, Linn. Syst. Nat. i. p. 787.

*Agraulis vanillæ*, Godm. & Salv. Biol. Centr.-Am., Rhop. i. p. 171.

A very widely ranging species, found throughout the whole of tropical America, as well as in the West-Indian Islands.

## 4. JUNONIA CÆNIA.

*Junonia cænia*, Hübn. Samml. ex. Schmett. ii. t. 32; Godm. & Salv. Biol. Centr.-Am., Rhop. i. p. 220.

Agrees with specimens from the Greater Antilles and from Central America.

## 5. ANARTIA IATROPHE.

*Papilio iatrophe*, Linn. Syst. Nat. i. p. 779.

*Anartia iatrophe*, Godm. & Salv. Biol. Centr.-Am., Rhop. i. p. 221.

This species has already been noticed in the Greater Antilles.

## 6. DIDONIS BIBLIS.

*Papilio biblis*, Fabr. Syst. Ent. p. 505.

*Didonis biblis*, Godm. & Salv. Biol. Centr.-Am., Rhop. i. p. 277.

Agrees with South-American specimens. The same species has also been found in Haiti.

## 7. DIADEMA BOLINA.

*Papilio bolina*, Linn. Syst. Nat. i. p. 781.

Mr. Angas's first collection contained a single female of this eastern species which has long been known to have become naturalized in Guiana. Since his return to England Mr. Angas has received several male specimens of this conspicuous insect from his friend Mr. Nicholls, who says it appeared suddenly in the island in comparative abundance after a violent hurricane, and that during a ten years' residence in Dominica he had not previously observed it.

## 8. ANÆA DOMINICANA, sp. nov. (Plate XXV. fig. 1.)

*Alis supra fuscis, apicibus marginibusque obscuris; anticis maculis ultra cellulam duabus, aliisque infra, lituram fere obsoletam formantibus, flavescens; posticis caudatis punctis, in marginem angulum analem versus, nigris; subtus griseo irroratis, triente posticarum distali fusca, punctis viridibus notatis linea ferruginea ab angulo apicali ad angulum analem transeunte.*

Very similar to *A. verticordia*, Hübn., from Haiti, from which, however, it differs in its smaller size, and in having the three yellowish spots towards the posterior angle of the primaries alone indicated by an indistinct confluent mark. Another allied species is the Cuban *A. echemus*, which is said to be also found on the mainland.

This latter species is the type of Westwood's genus *Cymatogramma*, one which has of late years been merged in *Anæa* (= *Paphia*). Like *Anæa* the subcostal branches join the costal, but there are, strictly speaking, only two of them, the second being itself branched.

## 9. LYCÆNA HANNO.

*Papilio hanno*, Stoll, Suppl. Cram. t. 39. f. 2 B.

*Rusticus adolescens hanno*, Hübn. Samml. ex. Schmett. i. t. 98.

There are many specimens of this widely ranging species in the collection.

10. *LYCÆNA CASSIUS*.

*Papilio cassius*, Cram. Pap. Exot. t. 23. f. C, D.

Of this widely dispersed species Mr. Angas brought home only a pair.

11. *THECLA SALONA*.

*Thecla salona*, Hew. Deser. of Lyc. p. 31; Ill. Diurn. Lep. p. 159, t. 63. f. 429, 430.

There are three specimens in poor condition in the collection. They agree fairly with others thus named by Mr. Bates, who took them in the Amazons valley.

12. *TEIAS DEVA*.

*Papilio agave*, Fabr. Ent. Syst. iii. p. 193 (nec Cram.).

*Terias deva*, Doubl. Gen. Diurn. Lep. p. 78; Bates, Journ. Ent. i. p. 240.

Many specimens, agreeing with others thus named by Mr. Bates from the Amazons. This species also occurs in Central America, but we have no examples of it from any of the other West-Indian islands.

13. *PIERIS VIRGINIA*.

*Pieris virginia*, Godt. Enc. Méth. ix. p. 141; Luc. Lép. Ex. t. 33. f. 1, p. 64.

*Mylothris hemithea*, Geyer in Hübn. Zutr. viertes Hund. p. 24, f. 693, 694.

A little known species, of which there are several specimens in the collection. These agree with Godart's description and Lucas's figure. We much doubt if *P. vallei* of Boisduval, attributed to Cuba, is really distinct. It is not included in Herrich-Schäffer's list of the butterflies of that island, and the figure in La Sagra's work is not very trustworthy.

14. *CALLIDRYAS ARGANTE*.

*Papilio argante*, Fabr. Syst. Ent. p. 470.

*Callidryas argante*, Bates, Journ. Ent. i. p. 238.

Many specimens, all rather smaller than the average of continental examples.

15. *CALLIDRYAS EUBULE*.

*Papilio eubule*, Linn. Syst. Nat. i. p. 764.

*Callidryas eubule*, Bates, Journ. Ent. i. p. 239.

Also a common species, and the specimens, like those of *C. argante*, of small size.

16. *CALLIDRYAS TRITE*.

*Papilio trite*, Linn. Syst. Nat. i. p. 763.

*Callidryas trite*, Bates, Journ. Ent. i. p. 239.

This too is a common species, but the individuals are about of the normal size.

17. *PAPILIO NEODAMAS*.

*Papilio neodamas*, Lucas, Rev. Zool. 1852, p. 193, t. 10. f. 5.

Of this species little is known. Lucas, when describing it, gave its locality as "Les Antilles;" and this is the first time its residence has been traced to any particular island.

Its nearest ally is *P. polydomas*, from which it differs in having the greenish-yellow transverse band straighter and running further from the outer margin; beneath, the wings are blacker, the submarginal band of red spots more conspicuous, and the yellow cilia restricted to the indentations of the outer margin.

18. *THYMELE PROTEUS*.

*Papilio proteus*, Linn. Syst. Nat. i. p. 794.

Many specimens of this very widely distributed species.

19. *THYMELE SANTIAGO?*

*Eudamus santiago*, Lefebvre, in La Sagra's Hist. Cuba, vii. p. 267.

Mr. Angas's collection contains several specimens which resemble Cuban examples which we attribute to this species. There are, however, several points of difference which will perhaps be found to be specific when the group is systematically investigated. The secondaries have a more rounded outer margin and a shorter tail; beneath, these wings are much darker, and there is no paler patch on the outer margin near the apical angle. The vitreous spots of the primaries are very small, and in some specimens entirely wanting.

20. *PROTEIDES ANGASI*, sp. n. (Plate XXV. fig. 2.)

*Alis fuscis, ad basin fulvis, anticis valde productis, maculis quatuor hyalinis in linea transversa a costa angulum analem versus transeuntibus, aliis duobus minutis apici propioribus; subtus anticis fere ut supra sed fulvo ad basin absente, posticis obscure fuscis, litura irregulari medium alarum occupante rubro-fusca, marginem externum versus punctis nigrescentibus notatis.*

Mr. Angas brought home several specimens of this Skipper, which appears in Dominica to represent *P. idas* of Cramer. This latter insect has a wide range upon the American continent, and extends to the island of Haiti. *P. angasi* differs, however, from it in having the fulvous colour at the base of the wings more restricted, in wanting the white cilia of the outer margin of the secondaries, and the grey mottling of the undersurface is entirely absent, though a faint indication of the pattern on the secondaries exists. The white bands, so conspicuous on the body of *P. idas*, are obsolete.

Lefebvre, in La Sagra's 'Historia de Cuba' (vii. p. 271), under the name of *Goniloba mercurius*, alludes to certain specimens, which he briefly describes. These would appear to be very like the species we now characterize.

21. *TELEGONUS ANAPHUS*.

*Papilio anaphus*, Cram. Pap. Ex. t. 178. f. F.

A single example, which we refer to this species, is included in Mr. Angus's collection. It is, however, rather different from our continental specimens of this insect. The pale fulvous band of the secondaries beneath is restricted to a narrow and ill-defined sub-marginal band, beyond which again the wing assumes a darker colour. We have in our collection a single specimen from the island of Haiti which agrees with this Dominican insect; but as we find the fulvous band in our series from the mainland differing considerably in certain individuals, we await further material before we are inclined to consider the Dominican insect worthy of specific distinction.

22. *HESPERIA? AMYNTAS*.

*Hesperia amyntas*, Fabr. Syst. Ent. p. 533.

*Polygonus lividus*, Hübn. Samml. ex. Schm. ii. t. 144.

This is a very common insect in tropical America.

23. *PYRGUS SYRICHTUS*.

*Hesperia syrictus*, Fabr. Syst. Ent. p. 534.

*Pyrgus syrictus*, Strecker, Cat. Am. Macrol. p. 176.

A common species in Dominica, as elsewhere.

24. *PAMPHILA ETHLIUS*.

*Papilio ethlius*, Cram. Pap. Ex. t. 392. f. A, B.

A single specimen of this common South-American species.

25. *PAMPHILA OCOLA*.

*Hesperia ocola*, Edw. Proc. Ent. Soc. Phil. ii. p. 20, t. 11. f. 4.

Agrees with North-American examples of this species sent us by Mr. Strecker. The figure given of it in the 'Proceedings of the Entomological Society of Philadelphia' is scarcely recognizable.

According to our views, the species ranges from North America through Mexico, Central and South America, to South Brazil; and though we have not as yet found an older name for it, so common a species can hardly fail to have one.

Mr. Angus's specimens are perhaps a little darker beneath than usual, but the difference is not material.

26. *PAMPHILA PHYLÆUS*.

*Papilio phylæus*, Drury, Ill. Nat. Hist. i. t. 13. f. 4, 5.

*Pamphila phylæus*, Strecker, Cat. Am. Macrol. p. 164; Lefebvre, in La Sagra's Hist. Cuba, vii. p. 277.

*Phemidias augias*, Hübn. Zutr. zweit. Hund. p. 10, f. 227, 228.

*Pamphila bucephalus*, Steph. Ill. Brit. Ent., Haust. i. p. 102, t. 10. f. 1, 2.

*Pamphila hala*, Butl. Trans. Ent. Soc. 1870, p. 504.

This species was originally described by Drury from specimens

obtained in the islands of "Antigua, St. Christopher, and Nevis, &c." It has since been traced from Maryland southwards to the Gulf of Mexico and to the Pacific Ocean, throughout the West-Indian islands and Central America, and in South America to the Argentine Republic.

Stephens's *P. bucephalus* was based upon specimens said to have been captured near Barnstaple, in Devonshire, but which were suspected to have come from North America. The figure represents a male, and not a female as stated by Mr. Strecker.

*P. hala* was based by Mr. Butler upon a single female specimen, now in our possession, from Venezuela. This differs in no way from the ordinary type of the female of this exceedingly common species. Mr. Butler is silent as to the sex of his type, nor does he say a word as to the alliances of the insect he describes!

27. *PAMPHILA RAVOLA*, sp. n. (Plate XXV. figs. 3, 4.)

*Alis læte saturate ochraceis, anticis margine externo, plaga magna ad angulum apicalem venam medianam attingente et stria super ramos radiales nigris; plaga tumida cellulari ad ramum medianum primum et extra eam penicillo nigro notatis: posticis margine costali et ad angulum analem nigris, margine externo angustissime nigro, ciliis disco concoloribus: subtus fere omnino saturate ochraceis fere unicoloribus, anticis ad marginem externum fuscescentibus et maculis duabus, una ad cellulæ basin, altera ad angulum analem fusco-nigris.*

♀. *Anticis, absque plaga tumida et penicillo nigro, omnino fuscescentioribus; costæ dimidio basali, macula subapicali et fascia mediana margini externo subparallela ochraceis; posticis fusco latiore marginatis; subtus sicut in mare sed alis paulo obscurioribus: corpore fusco, ochraceo tincto; palpis sordide albidis, antennis ochraceo terminatis.*

*Hab. Dominica (Angas).*

*Obs. P. vitellio* (Hübner.) (Samml. ex. Schm. ii. t. 153) quoad colores affinis sed plaga magna ad angulum anticarum analem diversus.

We have been unable to find any species at all resembling this either in our own collection or in that of the British Museum.

Mr. Angas's collection contains a good series of specimens of both sexes.

DESCRIPTION OF PLATE XXV.

- Fig. 1. *Anæa dominicana*, p. 316.
2. *Proteides angasi*, p. 318.
3. *Pamphila ravola*, ♂, p. 320.
4. ———, ♀, p. 320.
5. *Syntomedia angasi*, p. 321.
6. *Eucereon imriei*, p. 322.

## 6. On a Collection of Heterocera from Dominica.

By HERBERT DRUCE, F.L.S., F.Z.S.

[Received May 6, 1884.]

(Plate XXV.)

The Heterocera enumerated in the present list were collected in Dominica by Mr. George French Angas, who has kindly allowed me to select any specimens that I require for my collection. I find that the Moths from Dominica are mostly the same as those from Jamaica and Saint Domingo; some I am unable to determine with certainty, and I therefore think it better not to describe them as new species without seeing more specimens. I hope that Mr. Angas will endeavour to obtain further collections from this island, as I feel sure that many more species still remain to be discovered. The collection contained examples of about one hundred and four species, two of which I have described as new.

## HETEROCERA.

1. *AELOPUS TANTALUS*, Linnæus, Mus. Lud. Ulr. p. 361.
2. *ENYO LUGUBRIS*, Linnæus, Mantissa, p. 537 (1771).
3. *CHÆROCAMPA TERSA*, Linnæus, Mantissa, p. 538 (1771).
4. *PHILAMPELUS LINNEI*, Grote and Robinson, Proc. Ent. Soc. Phil. v. pp. 157, 179, 182, t. 3. f. 3.
5. *PHILAMPELUS LABRUSCÆ*, Linnæus, Mus. Lud. Ulr. p. 352.
6. *PACHYLIA FICUS*, Linnæus, Mus. Lud. Ulr. p. 353.
7. *AMBULYX STRIGILIS*, Linnæus, Mant. p. 538.
8. *ANCERYX ALOPE*, Drury, i. p. 58, t. 27. fig. 1.
9. *DILOPHONOTA ELLO*, Linnæus, Mus. Lud. Ulr. p. 351.
10. *DILOPHONOTA MERIANÆ*, Grote, Proc. Ent. Soc. Phil. v. pp. 75 & 168, t. 2. fig. 2.
11. *PROTOPARCE RUSTICA*, Fabricius, Syst. Ent. p. 540.
12. *PROTOPARCE CINGULATA*, Fabricius, Syst. Ent. p. 545.
13. *SYNTOMEDIA ANGASI*, sp. n. (Plate XXV. fig. 5.)

Primaries black, glossed with dark blue, crossed by three irregular whitish hyaline bands broken into spots by the nerves—the first nearest the base, a central spot, the second about the middle, two spots, and the third near the apex, four spots. Secondaries bluish-black, with the base and a wide central band whitish hyaline. Head, thorax, and abdomen black, shot with blue in some lights; a wide white band at the base of the thorax. Antennæ and legs black. The

underside the same as above. The female does not differ from the male except being slightly larger in size.

Expanse, ♂  $1\frac{3}{4}$  inch.

This species is allied to *S. sauleyi*. Three specimens of this insect were obtained by Mr. Angas, two males and one female.

14. *COSMOSOMA* AUGE, Linnæus, Syst. Nat. i. p. 807.

15. *EUCEREON* IMRIEI, sp. n. (Plate XXV. fig. 6.)

Primaries dark brownish black, with a wide broken white spot near the apex extending from the costal margin to near the anal angle. Secondaries semitransparent, white, with the margins broadly bordered with brown. Head, thorax, and base of abdomen brown, the thorax slightly speckled with reddish scales. Abdomen bright red, the anus and a row of spots on each side black. Antennæ, palpi, and legs black, the tarsus banded with white.

Expanse  $1\frac{5}{8}$  inch.

By the desire of Mr. Angas I have named this species after the late Dr. Imrie.

16. *PHÆGOPTERA* CORNEA?, Her.-Schäff. Exot. Schmett. t. 14. f. 62.

A single example in bad condition of what I believe to be this species.

17. *PHÆGOPTERA*, sp.?

The specimen is in such poor condition that I am unable to make it out.

18. *ECPANTHERIA* ERIDANE, Hübner, Samml. exot. Schmett. t. 191.

19. *COMPOSIA* SUBCYANEA, Walk. Cat. i. p. 230.

20. *DEIOPEIA* ORNATRIX, Linn. Syst. Nat. ii. p. 839.

This species is very common.

21. *MELANCHROIA* CEPHISE, Cramer, Pap. Exot. iv. t. 381. f. E.

22. *LEUCANIA* ANTICA, Walker, Cat. ix. p. 100.

23. *EUTHISANOTIA* TIMAIS, Cram. Pap. Exot. iii. t. 275. fig. B.

24. *BÆCULA* CUPENTINA, Cram. Pap. Exot. iii. t. 252. fig. E.

A single example of this species agreeing well with Cramer's figure, also with specimens before me from Guatemala and Panama.

25. *XYLOPHASIA* DENTERNA, Guén. Noct. i. p. 140.

26. *PRODENIA* COMMELINÆ, Abbot & Smith, Lep. Ins. Georgia, ii. t. 95.

27. *AGROSTIS*, sp.

The condition of this specimen is so bad that it is quite impossible to identify it.

28. *HELIOTHIS ARMIGERA*, Hübner, Noct. t. 79. fig. 370.29. *CHLORIDEA RHEXIÆ*, Abbot & Smith, Lep. Ins. Georgia, ii. t. 100.30. *CELÆNA INCLINATA*, Walk. Cat. xi. p. 732.31. *CELÆNA SEMIFURCA*, Walk. Cat. xi. p. 732.32. *CELÆNA*, sp.

This insect is very close to *C. tepens*.

33. *MICRA*, sp.

Two specimens in very bad condition.

34. *PALINDIA JUNCIDA*, Guén. Noct. ii. p. 277.35. *PLUSIODONTA*, sp.36. *GONODONTA NUTRIX*, Cramer, Pap. Exot. iv. t. 312. fig. B.37. *GONODONTA TERETIMACULA*, Guén. Noct. ii. p. 367.38. *HOMOPTERA LUNATA*, Drury, Ill. Exot. Ins. i. t. 20. fig. 3.39. *HOMOPTERA EXHAUSTA*, Guén. Noct. iii. p. 14.40. *HOMOPTERA TERROSA*, Guén. Noct. iii. p. 11.41. *HOMOPTERA FULIGINOSA*, Walker, Cat. xiii. p. 1059.42. *HOMOPTERA*, sp.

A small species not in good condition.

43. *BOLINA FASCIOLARIS*, Hübn. Samml. exot. Schmett. f. 443, 444.44. *BOLINA BISTRIGA*, Walker, Cat. xiii. p. 1155.45. *OPHIDERES APTA*, Walker, Cat. xiii. p. 1221.46. *EREBUS ODORA*, Linnæus, Syst. Nat. i. p. 811.47. *BENDIS POAPHILOIDES*, Guén. Noct. iii. p. 215.

*Zethes umbrata*, Walk. Cat. xxxiii. p. 1024.

*Ephyrodes postica*, Walk. Cat. xxxiii. p. 1071.

Walker has described this species twice. I have examined the types in the British Museum, and find that they all belong to the same insect.

48. *OPHIUSA NARRANS*, Walk. Cat. xv. p. 1828.

49. PHURYS GARNOTI, Guénée, Noct. iii. p. 306.
50. PHURYS HELVINA, Guénée, Noct. iii. p. 307.
51. PHURYS IMMUNIS, Guénée, Noct. iii. p. 305.
52. PHURYS OPTABILIS, Walk. Cat. xiv. p. 1485.
53. REMIGIA DISSEVERANS, Walk. Cat. xiv. p. 1495.  
*Remigia persubtilis*, Walk. Cat. xiv. p. 1497.  
*Remigia remanens*, Walk. Cat. xiv. p. 1498.  
Walker has described this variable species three times.

54. THERMESIA GEMMATALIS, Guén. Noct. iii. p. 355.
55. AZETA MIRZAH, Guén. Noct. iii. p. 360.  
*Thermesia fusilinea*, Walk. Cat. xv. p. 1564.  
*Thyridospila suffusa*, l. c. xxxv. p. 1971.  
*Chabora undulifera*, l. c. xxxiii. p. 1114.

A common and very variable species. Walker has described it under three different names and placed it in three different genera. I have a larger series of specimens before me, and I do not see any characters whereby to separate them.

56. TETRATOCERA ERICATA, Cram. Pap. Exot. iv. t. 370. f. E, ♂,  
iii. t. 287. f. D, ♀.

57. URAPTERYX POLITIA, Cram. Pap. Exot. ii. t. 139. f. E.
58. EPIONE, sp.
59. IODIS INDECLARARIA, Walk. Cat. xxii. p. 541.
60. IODIS, sp.  
A single specimen in very poor condition.

61. BYSSODES ARGENTATA, Drury, Ill. Exot. Ins. ii. t. 14. f. 2.
62. ACIDALIA DEFIXARIA, Walker, Cat. xxii. p. 731.
63. ACIDALIA PERDILARIA, Walker, Cat. xxxv. p. 1626.

64. EROSIA, sp.  
A small white species; the specimens are much worn.

65. MACARIA ENOTATA, Guén. Phal. ii. p. 69.
66. MACARIA ÆQUIFERARIA, Walker, Cat. xxiii. p. 886.  
A single specimen of this insect was taken by Mr. Angas.
67. MACARIA ACIDALIATA, Walker, Cat. xxiii. p. 893.

68. CIDARIA, sp.
69. CIDARIA, sp.  
A very worn example.

70. *RHODARIA PHENICEALIS*, Hübner, Samml. exot. Schmett. i. f. 115, 116.

71. *RHODARIA*, sp.

Two or three specimens in poor condition.

72. *SYNGAMIA FLORELLALIS*, Cram. Pap. Exot. iv. t. 348. f. L.

73. *SAMEA ECCLESIALIS*, Guén. *l. c.* p. 194.

74. *SAMEA*, sp.

75. *HYMENIA FASCIALIS*, Stoll, Cram. Pap. Exot. v. t. 36. f. 13.

76. *ERETA TIPULALIS*, Walker, Cat. xvii. p. 426.

77. *CATACLYSTA PRINCIPALIS*, Walker, Cat. xxxiv. p. 1333.

A single example of this very pretty little species.

78. *ZEBRONIA SEMIZEBRALIS*, Walker, Cat. xxxiv. p. 1345.

79. *GLYPHODES SIBILLALIS*, Walker, Cat. xvii. p. 506.

80. *PHAKELLURA IMMACULALIS*, Guén. Delt. et Pyral. p. 297.

A single example was obtained.

81. *PHAKELLURA MARGINALIS*, Cram. Pap. Exot. iv. t. 371. f. D.

82. *MARGARONIA JAIRUSALIS*, Walker, Cat. xviii. p. 524.

83. *ASTURA ELEVALIS*, Guén. Delt. et Pyral. p. 319.

84. *BOTYS CEDIPODALIS*, Guén. *l. c.* p. 336.

85. *BOTYS TOGATIS*, Ledr.

86. *BOTYS CAMPALIS*, Guén. Delt. et Pyral. p. 344.

87. *BOTYS*, sp.

88. *BOTYS INCALIS*, Snellen, Tijdschrift v. Ent. 1874, p. 202, t. ii. f. 13.

89. *BOTYS EURYTALIS*, Walker, Cat. xviii. p. 574.

90. *BOTYS*, sp.

A common dark-coloured species.

91. *BOTYS AGAVEALIS*, Walker, Cat. xvii. p. 576.

92. *BOTYS*, sp.

The collection only contained one specimen of this species.

93. *BOTYS GRAPHITALIS*, Snellen, Tijdschrift v. Ent. 1874, p. 199, t. 11. f. 9.

94. *CRAMBUS*, sp.

95. *CYDOSIA NOBILILELLA*, Walker.

The collection contains about eight other species; but the specimens are in such poor condition that I cannot with any certainty make them out.

---

May 20, 1884.

Sir Joseph Fayrer, F.R.S., V.P., in the Chair.

Mr. W. T. Blanford exhibited a series of heads of *Ovis poli*, and made the following remarks:—

I am indebted to the Hon. Charles Ellis, who has recently returned from Yarkand, for the opportunity of exhibiting by far the finest collection of *Ovis-poli* heads that has, I believe, ever been brought to Europe. The whole of the specimens were obtained near Sarikol, in the south-eastern part of the Pamir tableland. The original locality whence *Ovis poli* was obtained is a few marches further west.

The details given by Sir V. Brooke and Mr. B. Brooke in their paper, P. Z. S. 1875, p. 509, "On the large Sheep of the Thian Shan, and the other Asiatic Argali," appear to show that the only known essential distinctions between *Ovis poli*, Blyth, and *Ovis karelini*, Severtzoff, are in the form of the horns. A translation of the principal characters given by Severtzoff in his work on the fauna of Turkestan<sup>1</sup> is furnished; and the other distinctive characters are the larger size of *O. poli*, and some slight differences in external coloration, which are shown by the specimens examined by Messrs. Brooke not to be constant. According to Severtzoff the lachrymal bone in the skull of *O. poli* is more developed than in *O. karelini*, and there is said to be a difference in the proportional growth of different parts of the skull; but it may fairly be questioned whether these distinctions are of specific value. The difference in size is more important: *Ovis karelini* is said to be 5' 10" to 6' long and 3' 6" high at the shoulders; *O. poli* 6' 7" long and 3' 10" high; but a similar difference is found in races of other wild Ungulates, e. g. *Capra agagrus*. The most important distinction is, however, in the horns. Those of *O. poli* are longer, and diverge much more on each side of the head, so that the extreme distance between the tips, measured in a straight line, is much greater compared to the actual length of the horns round the curve, and to the other dimensions of the animal. In four adult specimens of *O. karelini* of which the measurements are

<sup>1</sup> For a complete translation see Ann. & Mag. Nat. Hist. 1876, ser. 4, vol. xviii. pp. 171, 210, 212, 217, and 220.

given in the paper I have quoted, the length of a horn round the curve varies from  $42\frac{1}{2}$  inches to  $48\frac{1}{2}$ , the mean being 45, and the distance from tip to tip of horns in a straight line 31 to 36, mean 33; whilst in six adult specimens of *O. poli* the length of horn is from 49 to 63, mean  $55\cdot25$ , and the distance between the tips  $43\frac{1}{2}$  to 55, mean  $48\cdot25$ ; or the mean ratio in *O. karelini* is 100:73, and in *O. poli* 100:87<sup>1</sup>.

The following are the measurements of the eleven specimens now exhibited. Where there is any difference in the length of the two horns, that of the longer horn is given, it being assumed that the deficiency in the other is due to wear. The horns are measured from the base in front over the outside curve of the frontal surface to the tip; the distance from tip to tip is of course measured in a straight line.

	Length of horns round curve.	From tip to tip of horns in a straight line.	Ratio.
No. 1.....	58	51	100 : 88
2 (fig. 1)	58	$50\frac{1}{2}$	100 : 87
3.....	$57\frac{1}{2}$	47	100 : 82
4.....	62	$47\frac{1}{2}$	100 : 76
5.....	$63\frac{1}{2}$	48	100 : 75
6.....	$61\frac{1}{2}$	$46\frac{1}{2}$	100 : 75
7.....	$59\frac{1}{2}$	$43\frac{1}{4}$	100 : 73
8.....	61	43	100 : 70
9 (fig. 2)	55	37	100 : 67
10.....	$60\frac{1}{2}$	$39\frac{1}{2}$	100 : 65
11 (fig. 3)	$63\frac{1}{2}$	39	100 : 61

In the last specimen one horn is slightly imperfect at the end, and an allowance is made for the deficiency in estimating the length from tip to tip.

Figs. 1 and 3 (p. 328) represent the extreme types. Fig. 2 is taken from an intermediate head with singularly stout horns, each of them measuring 17 inches in circumference at the base, whilst the much longer horns of figs. 1 and 3 have the circumference respectively of only  $15\frac{1}{2}$  and 16 inches.

It is unnecessary to point out that these heads completely bridge the interval between the two forms *O. poli* and *O. karelini* so far as the curve of the horns is concerned.

The other distinctive characters to which importance was attached by Severtzoff are the following, so far as I can make out the distinctions from the translation of his work.

1. In *O. poli* the horns are pressed in from the sides, especially the orbital surface<sup>2</sup>. In *O. karelini* the orbital surface is flat, the frontal

<sup>1</sup> The extremes are, in *O. karelini* 100:67 and 100:79, in *O. poli* 100:79 and 100:101; but none of the specimens of *O. karelini* had horns exceeding  $48\frac{1}{2}$  inches in length, and it appears to be evident that, as a rule, the greatest proportional divergence is shown by younger animals.

<sup>2</sup> For meaning of these terms, see P. Z. S. 1875, p. 511.

Fig. 1.



Fig. 2.



Fig. 3.



Heads of varieties of *Ovis Poli*.

surface very convex. In the first named all the edges are rounded ; in the latter all with the exception of the fronto-nuchal. The details given by Messrs. Brooke show that these distinctions are not constant ; in both forms surfaces and edges grow more rounded in older individuals. Precisely the same conclusions may be drawn from the series now exhibited.

2. In *O. karelini* the axis of the terminal portion of the horn is parallel with the axis of the basal portion. In *O. poli* the axis of the terminal portion diverges more from the skull than that of the basal portion. This difference depends entirely on the degree of divergence, which is shown to vary and to pass by insensible gradations from one form to the other.

3. In *O. karelini* the horns are said to form a spiral that would fit on a cone with the base towards the skull ; in *O. poli* the base of a cone on which the horns would fit is away from the skull. I doubt if this character is of any importance ; it is not noticed by Sir V. Brooke. If there be any distinction, it, like the last, probably depends on the degree of divergence of the horns.

4. In *O. poli* the horn is more than four times the length of the skull, in *O. karelini* only three times as long. But in some of the specimens of the latter, measured by Messrs. Brooke, each horn was more than  $3\frac{1}{2}$  times the length of the skull ; and in the heads now exhibited, horns (e. g. no. 11) having the curve of *O. karelini* are 63 inches in length, or more than four times as long as any skull measured.

The only conclusion to which I can come is, that there is no constant difference of specific value between *Ovis karelini* and *O. poli*.

---

Mr. R. Bowdler Sharpe exhibited and made remarks on a second specimen of the new European Nuthatch (*Sitta whiteheadi*) from Corsica, described at the Meeting on April 1st. (v. s. p. 233.) This specimen (a male) had been likewise obtained by Mr. Whitehead.

---

Dr. J. G. Garson exhibited and remarked upon a specimen of *Lithodes maia*, the northern Stone-Crab.

---

The following papers were read :—

1. Preliminary Notice of the Isopoda collected during the Voyage of H.M.S. 'Challenger'.—Part I. *Serolis*. By FRANK E. BEDDARD, M.A., F.R.S.E., F.Z.S., Prosector to the Society<sup>1</sup>.

[Received May 20, 1884.]

The specimens of *Serolis* dredged during the voyage of the 'Challenger' are referable to sixteen species, of which seven have been more or less fully described by previous writers. Six of these species are as follows:—*Serolis cornuta*, Studer; *Serolis latifrons*, White; *Serolis septemcarinata*, Miers (= *Serolis ovalis*, Studer); *Serolis paradoxa*, Fabr. sp. (= *Serolis Orbigniana*, M.-E.); *Serolis schythei*, Ltk.; *Serolis tuberculata*, Grube. There is besides a single specimen which is closely similar to the type specimens of *Serolis convexa*, Cunningham, preserved in the British Museum, but shows certain slight differences in which it more closely resembles *Serolis plana*, Dana; I am inclined to think that these two species are identical. The chief character which Grube uses to differentiate *Serolis convexa* from *Serolis plana*, and also *Serolis gaudichaudii*, is the presence in the former of a tuft of hairs upon the fourth joint of the second thoracic appendages. Having examined both *Serolis convexa* and *Serolis gaudichaudii*, I am able to state that it is the males only and of both these species which are thus characterized<sup>2</sup>. *Serolis gaudichaudii* is, however, quite a distinct species, and cannot be confounded with *Serolis convexa*. Besides these seven species six other species of the genus *Serolis* are known, viz.:—*S. serrei*, Lucas; *S. gaudichaudii*, M.-E.; *S. carinata*, Lockington; *S. plana*, Dana; *S. trilobitoides*, Eights; and *S. acutangula*, Grube. Of these *Serolis acutangula* is probably identical with some other form, since Grube, who originally described it, omits all mention of it in his subsequently published monograph of the genus; *Serolis plana* appears to me to present no clearly defined differences by which it can be with certainty separated from *Serolis convexa*; the figure given by Eights of *Serolis trilobitoides* is so poor, and his description, which does not in all respects tally with the figure, so incomplete that it is not easy to distinguish this species from *Serolis cornuta*, St. Further details are required concerning *Serolis serrei* and *Serolis carinata*.

The total number of species of *Serolis* at present known with certainty is therefore eight.

The nine new species in the 'Challenger' collection I propose to name as follows:—

<i>Serolis bromleyana</i> (Suhm).	<i>Serolis elongata</i> .
<i>Serolis neera</i> .	<i>Serolis pallida</i> .
<i>Serolis gracilis</i> .	<i>Serolis longicaudata</i> .
<i>Serolis antarctica</i> .	<i>Serolis minuta</i> .
<i>Serolis australiensis</i> .	

<sup>1</sup> Published by permission of the Lords Commissioners of the Treasury.

<sup>2</sup> Since the above was written I find that Studer (Abhandl. d. Kön. Preuss. Akad. Wiss. Berlin, 1883) has come to a similar conclusion.

The first five are all inhabitants of deep water; the remaining species were dredged in shallow water off the coasts of Southern and Eastern Australia.

1. *SEROLIS BROMLEYANA* (Suhm).

This species has already been briefly characterized by the late Dr. v. Willemoes Suhm from two specimens obtained near the Antarctic ice-barrier. These two specimens are the largest contained in the 'Challenger' collection; the male measures 54 millim. in length and 56 millim. in greatest breadth; the length from the anterior end of the rostrum to the termination of the 6th epimeron is 78 millim. The female is somewhat smaller than the male, and measures 45 millim. in length, 39 millim. in breadth, and 62 millim. from the rostrum to the end of the 6th epimeron. This species is one of the largest of the Isopoda. Like many of the other deep-sea species it has extremely long spine-like epimera, which are longer and project further outwards from the body in the males than in the females.

The cephalic shield stands out in relief from the surface of the first thoracic segment, from which it is separated by a suture lying in a deep depression; its anterior margin is prolonged into a short rostrum; the lateral portions of the cephalic shield extend for some way anterior to the rostrum, and are cut off from the rest by a ridge which passes almost in a straight line from the rostrum to the sides of the cephalic shield; the surface is raised into three rounded prominences, two on the inner side of the eyes and a median T-shaped prominence between them. The eyes are inconspicuous, owing to their pale greyish colour and absence of corneal facets. The epimera of the first thoracic segment are divided into three portions by a Y-shaped ridge; the other epimera gradually increase in length up to the sixth, which is the longest; both the epimera of the abdominal segments are extremely long and reach beyond the limit of the caudal shield in the male; in the female the last epimera barely reach the end of the caudal shield.

The caudal shield is oval in form and longitudinally carinate, the posterior end is slightly excavated; at about the middle of the caudal shield near the lateral margin is a notch on either side; the terminal appendages of the body are attached about halfway down the caudal shield. The colour (in spirit) is a dark slate-blue.

Station 156, 1975 fathoms; Station 164A, 410 fathoms; Station 168, 1100 fathoms; Station 169, 700 fathoms.

2. *SEROLIS NEÆRA*, n. sp.

This species almost rivals *Serolis bromleyana* in size; the largest male specimen measures 43 millim. in length and 47 millim. in greatest breadth, the length of the sixth (longest) epimeron being 38 millim.; the female is smaller than the male, the largest specimen measuring 40 millim. in length, 40 millim. in greatest breadth, the sixth epimeron measures 31 millim.

The males of *Serolis neæra* differ from the females therefore by their greater size, and also by the greater length of the epimera,

which project from the body almost at right angles with its long axis, while in the females their direction approximates more nearly to that of the sixth pair of epimera, which pass backwards almost parallel to the long axis of the body. In this respect *Serolis neara* resembles *Serolis bromleyana*.

The cephalic shield has its anterior margin produced into a short rostrum, and at some little distance from the anterior edge there is a ridge passing across from side to side exactly as in *Serolis bromleyana*; the lateral parts of the cephalic shield are not, however, so markedly prolonged as in the latter species; in other respects the cephalic shield differs greatly from *Serolis bromleyana*. The eyes are large and uniform, and distinctly faceted; between their anterior extremities are two pairs of flattened spine-like projections directed backwards, the outer one on each side being broader and slightly bifid at the tip. The hinder margin of the cephalic shield is indented, and forms three projections, the two outer ones being somewhat triangular in shape and tuberculated on the free margin, and the inner median one transversely elongate and much like the labium in shape, with a slightly convex outer margin. The epimera are long and spine-like, as in *Serolis bromleyana*. The epimera of the first thoracic segment are divided into two by a ridge which passes outwards and slightly upwards; the other epimera gradually increase in length up to the sixth, which is by far the longest; the epimera of the second abdominal segment extend considerably beyond the termination of the caudal shield; while those of the third segment only reach as far as the commencement of the lateral margin of the caudal shield; the outer margin of the former is slightly denticulate.

The thoracic segments are furnished with a backwardly directed median spine, which is largest upon the first three segments and almost disappears on the first two abdominal segments.

The caudal shield is very closely similar to that of *Serolis schythei*; at the upper end is a flat triangular spine, and between this and the posterior margin of the shield another smaller spine; on either side of the latter, and connected with it by a ridge, are two small spines, above which and rather to the outside is another short spine on each side continuous with a long ridge passing upwards and inwards, until it nearly reaches the lateral termination of the large anterior spine.

The second pair of antennæ are a trifle longer than the first pair. Station 320, 600 fathoms; Station 318, 2040 fathoms.

### 3. *SEROLIS GRACILIS*, n. sp.

Three examples of this species were dredged off Pernambuco, from a depth of 675 fathoms; they are all males.

The largest specimen measures 11 millim. in length by 12 millim. in breadth.

The cephalic shield is almost exactly like that of *Serolis bromleyana*, but the antero-lateral portions do not project so far forward; the eyes are small and inconspicuous, whitish in colour.

The epimera are well developed, but are more sickle-shaped and

flattened and not so spine-like as in the last two species; the sixth pair, as usual, are the longest, and project backwards beyond the caudal shield for a space of about its own length; the other epimera increase in size from before backwards; the anterior and posterior processes by which each epimeron "articulates" with the neighbouring ones are further away from the proximal end of the epimeron, which gives the epimera the appearance of being shorter than they really are; the fifth and sixth epimera (as well as the three in front) are separated from the tergal portion of the segments by a distinct suture. The epimeron of the first segment shows traces of its original composition out of two epimera by the presence of a transverse ridge, and another ridge, continuous with that upon the cephalic shield, crosses its anterior half, bending backwards at the margin to join the distal extremity of the first transverse ridge; the epimeron of the second free abdominal segment projects for a short distance beyond the caudal shield; the epimeron of the third abdominal segment extends about halfway down the caudal shield.

The caudal shield is divided into two portions by a sinuate transverse ridge; it is slightly keeled, and near the anterior margin is a short flat spine in the middle line, on either side of which is an obliquely placed ridge running towards the lateral margin of the caudal shield.

The two pairs of antennæ are about equal in length.

Station 120, 675 fathoms; off Pernambuco.

#### 4. *SEROLIS ANTARCTICA*, n. sp.

The three species just described agree with each other, and differ markedly from all the shallow-water species of *Serolis* by the enormous development of the epimera; the present species, although an inhabitant of the deep sea, has the general appearance of one of the shallow-water forms. The general form of the body is a broad oval; the epimera are comparatively short, and do not project backwards as long spiniform processes. This species is at once recognizable by the strongly marked sculpturing on the upper surface of the carapace, which is different from that of any other *Serolis*, and by the entire absence of eyes. In the place of the latter are two minute tubercles about 1 millim. in extent, which show no traces whatever of a faceted cornea, and no nervous structures could be detected beneath the tubercle, the cavity of which is occupied simply by a plug of connective tissue. The sculpturing on the dorsal surface, which is more marked upon the epimera, consists of a number of ridges arranged in a reticulate fashion. The form of the body differs in the two sexes: in the male the outline of the body is more circular than in the female; the breadth of the body in the former is proportionately greater than the length, owing chiefly to the greater length of the epimera. As in all other species of *Serolis* the sixth epimera are the longest, and extend just beyond the end of the caudal shield in the male; in the female the terminations of the sixth pair of epimera are just on a level with the end of the caudal shield. The ventral portion of the three free abdominal segments, which

usually differ in the two sexes, are the same in this species. The males also are larger than the females, the largest male specimen in the 'Challenger' collection measuring 34 millim. in length and 31 millim. in breadth, while the length of the largest female specimen is only 32 millim. in length by 26 millim. in breadth.

In both sexes the body is roof-shaped, sloping gradually downwards on either side from the median line, which is distinctly keeled; the posterior margin of each segment has a short tubercle in the median line. The cephalic shield has the same texture as the rest of the body, and hardly projects above the level of the first thoracic segment. The latter is not divided into two portions by a transverse suture; it is prolonged anteriorly into a short rostrum, and a ridge, which extends on either side from the rostrum to the lateral margins of the shield, divides off the antero-lateral portions as in *Serolis bromleyana*. The second, third and fourth epimera are separated by a distinct suture from the rest of the segment.

The caudal shield is irregularly pentagonal in outline; the posterior extremity is slightly turned up; there is a distinct median carina, which divides into two at the upper end; on either side of this is another Y-shaped ridge, inclined at a slight angle to the longitudinal axis.

The second pair of antennæ are distinctly longer than the anterior pair.

This species was dredged at the following stations:—Station 122, 400 fathoms; Station 146, 1375 fathoms; and Station 147, 1600 fathoms.

The remaining five species form a well-marked group, confined to the shores of Southern and Western Australia. They are to be distinguished by the characters of the fifth and sixth thoracic segments from all the other species of *Serolis*; the dorsal portion of the fifth segment is extremely narrow, while the dorsal portion of the sixth segment is either altogether absent or fused with the succeeding first abdominal segment; with one exception—*Serolis minuta*, which is a transitional form—the epimera of the abdominal segments are undeveloped and the caudal shield terminates in a slightly bifid tip; the first thoracic segment is not divided by a suture; the females also appear to be larger than the males; the last-mentioned characters however, although common to all the members of this particular group, are also to be found in other species. All these Australian species are small, the largest not measuring more than 20 millim. in length. One species belonging to this group is already known, viz., *Serolis tuberculata*, Grube.

##### 5. *SEROLIS AUSTRALIENSIS*, n. sp.

Of this species the 'Challenger' obtained three examples, two males and one female; both the males are the same size, measuring 11 millim. in length by 8 millim. in breadth; the female is rather larger, measuring 13 millim. in length and 11 millim. in breadth. In other

respects the two sexes do not differ, except of course in the form of the second thoracic and second abdominal appendages.

The form of the body is regularly oval, and the epimera overlap each other closely and do not project freely except the sixth pair, which project some way beyond the two last pairs.

The dorsal surface of the body is entirely covered with small rounded tubercles, and the posterior margin of each segment is occupied by a series of rather larger tubercles; in the middle of the posterior margin of each segment, including the cephalic shield, is a short backwardly directed spine. As in *S. longicaudata*, the sutures separating the fifth thoracic from the sixth and the sixth from the first abdominal are incomplete in the middle line.

The caudal shield is irregularly triangular in outline, it has a slight carina. About the middle a row of rather larger tubercles crosses the carina at right angles; one of these tubercles on each side, close to the lateral margin of the caudal shield, is conspicuously large.

The middle portion of the scuta of the three free abdominal segments is prolonged into a spine, that of the first abdominal segment being by far the larger.

Both pairs of antennæ are of about the same length.

Station 162, 38 fathoms.

#### 6. *SEROLIS ELONGATA*, n. sp.

This species in its general configuration is not unlike *Serolis australiensis*, and it is very possible that the examination of a large series of specimens would prove that the two are identical. In the meantime, however, the single specimen contained in the 'Challenger' collection is sufficiently different to warrant its separation as a distinct species.

The specimen, which has the characters of a female, measures 10 millim. in length by 6 millim. in breadth. The surface of the body is not so much covered with tubercles as in *Serolis australiensis*; the posterior margin of the cephalic shield and the free segments of the body, except the first, is prolonged into a stout hook-like spine, and the thoracic segments have a line of short tubercles on either side of the central spine.

The caudal shield is keeled; a row of tubercles runs across it at right angles, the outermost one on each side being the largest; another row of tubercles traverses the lateral margin of the caudal shield.

Station 163A, 30 fathoms.

#### 7. *SEROLIS PALLIDA*, n. sp.

The 'Challenger' obtained two specimens of this species, one a male and the other a female.

The female is the larger, measuring 16 millim. in length and 13 millim. in breadth, while the male is only 9 millim. long and 7 millim. broad. The body is oval, somewhat pear-shaped from the form of the caudal shield, which narrows rapidly towards the end. All the segments of the body, except the first, fifth, and sixth, are

furnished with a median, backwardly projecting spine; these spines are considerably larger in the female than they are in the male; the rest of the body is perfectly smooth and free from tubercles. The epimera are short and closely approximated, the points only of the fourth, fifth, and sixth projecting freely; the suture separating the fifth thoracic segment from the first abdominal is continuous from one side of the body to the other; the dorsal portion of the sixth segment is not represented as in the other Australian forms. The cephalic shield is almost triangular in outline from the great development of the ocular prominences and the posterior spine.

The caudal shield is hexagonal in outline, the posterior end markedly bifid; it has a longitudinal keel, and on either side, just below and to the inside of the notch which covers the articulation of the last pair of appendages, is a minute flattened tubercle. The abdominal segments have a median ventral spine, larger in the female.

The second pair of antennæ are slightly longer than the first pair; the fifth joint is remarkably large and swollen, and this feature serves to identify the species.

The lower surface of the labium and basal portion of the mandibles and maxillipedes is much sculptured.

Station 163A, 35 fathoms; and Station 162, 38-40 fathoms.

#### 8. *SEROLIS LONGICAUDATA*, n. sp.

The aspect of this species is peculiar and very unlike the typical form of the genus. The anterior portion of the body is almost completely circular, and the caudal shield is extraordinarily long, about half as long as the rest of the body; the epimera are short and truncate at their outer ends. The segments gradually increase in breadth up to the fourth; the fifth and sixth are considerably shorter. The suture between the epimera and the tergal portion of segments two and three is situated about halfway between the articulation of the limb and the outer margin of the segment, and in the succeeding segments comes to approximate more closely to the point at which the limbs arise; hence the epimera themselves gradually increase in length from the first to the sixth as in all other species, though the circular form of the body makes it appear at first sight as if the third pair were the longest.

The single specimen contained in the 'Challenger' collection is a female; it measures 7 millim. in length and 5 millim. in greatest breadth. The surface of the body is quite smooth and free from tubercles; the sides of the thorax slope gradually downwards from the central portion, which is roof-shaped; the cephalic shield is not completely separated from the thoracic segment, the suture being incomplete posteriorly for a short space on either side of the median line; the fifth and sixth thoracic and the first abdominal segments are fused in the middle line.

The caudal shield is pentagonal in shape and longitudinally carinate; the last pair of appendages are attached about halfway down the side of the shield, and from this point a faint transverse ridge passes across at right angles to the longitudinal keel; a curved ridge follows

the lateral margin of the caudal shield on either side; the median portion of the three free abdominal segments projects freely as a long spine.

Station 161, 38 fathoms.

9. *SEROLIS MINUTA*, n. sp.

The 'Challenger' collection contains only a single example of this species; it is a male, and measures 4 millim. in length by about 4 millim. in breadth, and is therefore the smallest known species.

The dorsal portion of the fifth and sixth thoracic segments is proportionately wider than in the other Australian species, the diameter of the fifth segment being in fact hardly less than that of the fourth. The suture which separates the sixth from the succeeding segment is continued very nearly across the body; only a very small portion remains fused with and inseparable from the succeeding first abdominal segment.

The epimera of the second and third abdominal segments are well developed, and pass downwards along the caudal shield for about one third of its length; the first three epimera are closely approximated to each other, but the distal portions of the others project freely; the epimera of the two abdominal segments project further downwards than the last pair of thoracic epimera; the latter reach about as far as the lateral notch on the caudal shield, where the uropoda are attached. The first epimera show indications of division into two parts. The posterior margin of the cephalic shield is furnished with three blunt tubercles, of which the middle one is the largest; each of the succeeding segments is similarly produced into a short tubercle at the median point of the posterior margin.

The dorsal surface of all the thoracic segments except the first is prolonged on either side into a flat triangular process, which slightly overlaps the succeeding segment; these processes, which are hollow and serve for the attachment of the muscles moving the limbs, are situated on the tergal portion of the segment close to its junction with the epimeral portion.

The caudal shield is almost triangular in shape and ends in a long blunt spine; the upper surface slopes gently down on either side from the central keel. The terminal pair of appendages are attached close to the upper end of the caudal shield.

Station 161, 38 fathoms.

*Geographical Distribution.*—The genus *Serolis* has a limited and peculiar distribution; it is almost entirely confined to the Antarctic hemisphere. With two exceptions—*Serolis carinata*, recently described by Lockington as occurring on the shores of California, and *Serolis paradoxa*, which is said to have been obtained on the coast of Senegal—the shallow-water representatives of this genus are not found to range further north than lat. 30° S.; they inhabit the shores of all the continents and the principal groups of islands in this portion of the globe, with the exception of the Cape of Good Hope, viz. Patagonia and the Falkland Islands, the three Antarctic archipelagos (Marion Isles, the

Crozetts, and Kerguelen), the shores of New Zealand (?) and some of the adjacent islands, and the southern and eastern coasts of Australia. The different species have a more or less restricted area of distribution. Seven species (*Serolis paradoxa*, *Serolis schythei*, *Serolis gaudichaudii*, *Serolis plana*, *Serolis convexa*, *Serolis serrei*, *Serolis trilobitoides*) are found in Patagonia and the Falkland Islands. Of two of these Patagonian species, *Serolis schythei* and *Serolis paradoxa*, there are specimens in the British Museum labelled "New Zealand," but I believe that this locality is not authenticated beyond a doubt. Three species, *Serolis cornuta*, *Serolis septemcarinata*, and *Serolis latifrons*, are found at Kerguelen. Of these *Serolis latifrons* has also been obtained at Possession Island, and at the Auckland Islands south of New Zealand; *Serolis cornuta* is a very close ally of *Serolis trilobitoides*, if not identical with it; *S. septemcarinata* is common to all three groups—Kerguelen, the Crozetts, and Marion and Prince Edward's Islands. The six species that occur on the shores of Australia are, as has already been pointed out, distinguished by certain characters which unite them together and differentiate them from the other species of the genus.

These facts agree with what is known about the distribution of many other shallow-water animals. As a rule, there appears to be a close resemblance between the faunas of New Zealand, Kerguelen, and S. America, while the Australian species do not present such resemblances to the New-Zealand species as might perhaps be expected from the close proximity of the two regions.

The deep-sea species of *Serolis* have a wider range than the shallow-water species, although none have as yet been obtained north of the equator. *Serolis antarctica* ranges from off Pernambuco to the neighbourhood of the Crozetts. Two other species, *Serolis gracilis* and *Serolis neæra*, were obtained in deep water off the coast of S. America, the former at Station 120 just below the equator, and the latter at Stations 318 and 320 further south, off Buenos Ayres. *Serolis bromleyana* was dredged at Station 156, close to the Antarctic ice-barrier, and again considerably to the north off the coast of New Zealand and between New Zealand and Australia. The comparatively wide distribution of *Serolis bromleyana* and *S. antarctica* is interesting, and agrees with what is known respecting the geographical distribution of other deep-sea animals.

The greatest depth which this genus is known to inhabit is 2040 fathoms; a single specimen of *Serolis neæra* was dredged from this depth at Station 318. *Serolis bromleyana* was dredged in 1975 fathoms at Station 186, and in 1100, 700, and 410 fathoms in the neighbourhood of New Zealand; *Serolis antarctica* ranges from 400 to 1600 fathoms. *Serolis gracilis* was only dredged at one locality, and from 675 fathoms. Gerstaecker, in his account of the Isopoda in Bronn's 'Thierreich,' points out that many species which have a wide distribution are found in deeper water as they pass southwards from the equator to the pole, and instances (from v. Willemoes Suhm's Preliminary Report on the Crustacea, etc., Proc. Roy. Soc., 1874) *Serolis bromleyana* and another species which I have named *Serolis*

*antarctica*. Of both these species the specimens from the more southern latitudes and deeper water are larger than those found to the north and in comparatively shallow water; especially is this so with *Serolis bromleyana*. Comparing the deep-sea species with those from shallow water, it must be noticed that in two species from the deep sea, *Serolis bromleyana* and *Serolis neæra*, the genus attains to its largest size; these two species are indeed among the largest of the whole group Isopoda. Another deep-sea Isopod described by Milne-Edwards, viz. *Bathynomus giganteus*, a genus allied to the Cymathoadae, is also of colossal size; and the 'Challenger' collection contains a new deep-sea species which evidently belongs to the same family, and is also extremely large. All the deep-sea species of *Serolis*, with the exception of *Serolis antarctica*, have the epimera, especially those of the sixth pair, greatly elongated to an extent not found in any of the species inhabiting shallow water.

The chief differences, however, which are noticeable between the shallow-water and deep-sea representatives of the genus are to be found in the eyes.

It is well known that many deep-sea animals are entirely deprived of eyes, while in others (notably many fishes) the eyes are considerably enlarged though often pale in colour, owing to the partial absence of pigment. The presence of eyes in deep-sea animals, which would almost seem to be useless to their possessor, has been accounted for by the theory of "abyssal light," by which it is supposed that the light emanating from phosphorescent Aleyonarians is sufficient to enable these animals to see. Exact researches into the structure of eyes in the majority of deep-sea animals are wanting, and it is not certain how far optical structures are present. Up to the present the only comparison of the minute structure of the eyes in shallow-water and deep-sea representatives of the same group is, so far as I am aware, to be found in Dr. Hoek's Report on the 'Challenger' Pycnogonida. It appears from his results that the eyes in the deep-sea species are sometimes altogether absent, sometimes furnished with well-developed retinal structures; in some forms the eyes "have a distinct lens—a rounded spot marked by its brightness"; but they are quite destitute of pigment, and instead of a retina the cavity of the eyes is filled with a mass of connective tissue.

In *Serolis* the conditions are rather different; in none of the species from the deep sea is there a retinula developed, at least nothing at all similar to the retinula of the species from shallow water, but the vitreous body is represented. In *Serolis neæra* the cornea is distinctly faceted, and corresponding to each facet is an oval body which appears to represent a vitreous body; instead of being clear and transparent like the highly refractive vitreous bodies of the shallow-water *Serolis* and other Isopoda, this structure in *Serolis neæra* is granular and rather opaque in appearance, the upper half is encircled by a ring of pigment. The lower end of the "vitreous body" is imbedded in a mass of cells, which are small and closely pressed together, assuming in consequence a hexagonal contour; from the lower end of this mass of cells a stout nervous

bundle clothed with pigment-cells passes backwards. Two large nuclei of Sempér are present, lying between the anterior end of the vitreous body and the cornea.

In *Serolis bromleyana* the eye has much the same structure as in *Serolis neæra*, but the cornea is not faceted and there is no pigment whatever surrounding the vitreous bodies; the eyes in this species are therefore more rudimentary.

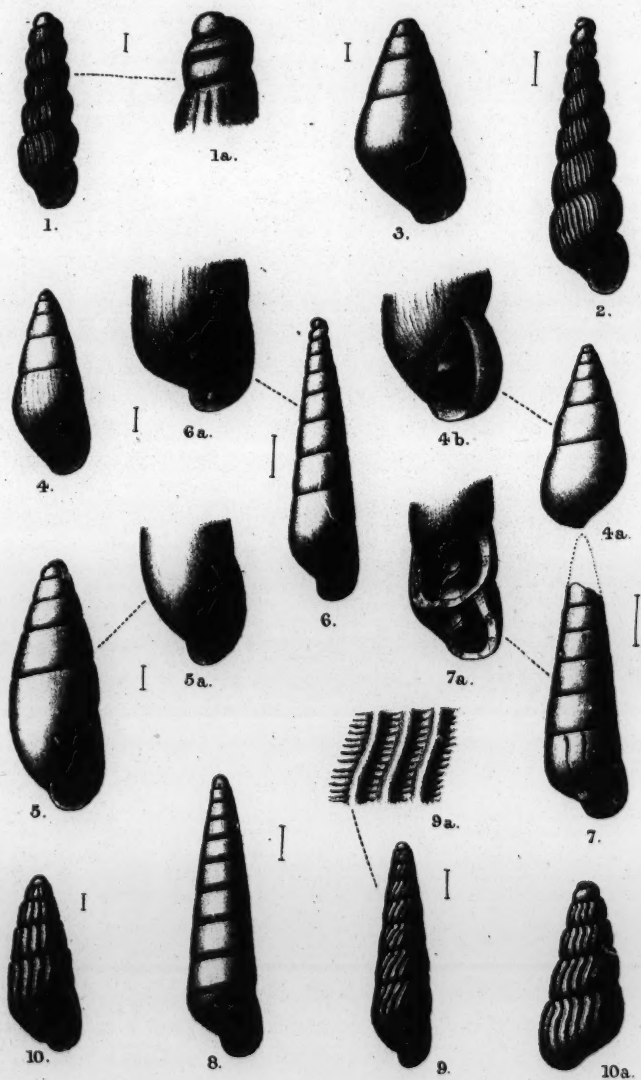
In *Serolis gracilis* one of the specimens has eyes exactly resembling those of *Serolis bromleyana*; in another the whitish tissue of the eye only occupies a comparatively small portion of the whole ocular protuberance; the third specimen is quite blind—the ocular protuberance is present but it is quite opaque and bluish-coloured, like the surrounding integument. In this species therefore the eye appears to be just on the verge of disappearance.

The only remaining deep-sea form, *Serolis antarctica*, is entirely deprived of eyes; two minute yellowish tubercles occupy the position that the eyes ought to occupy, but there is no trace of any cornea, the integument being precisely similar to that on the rest of the body though perhaps a little thinner, and the interior of the tubercle was filled simply with a plug of connective tissue.

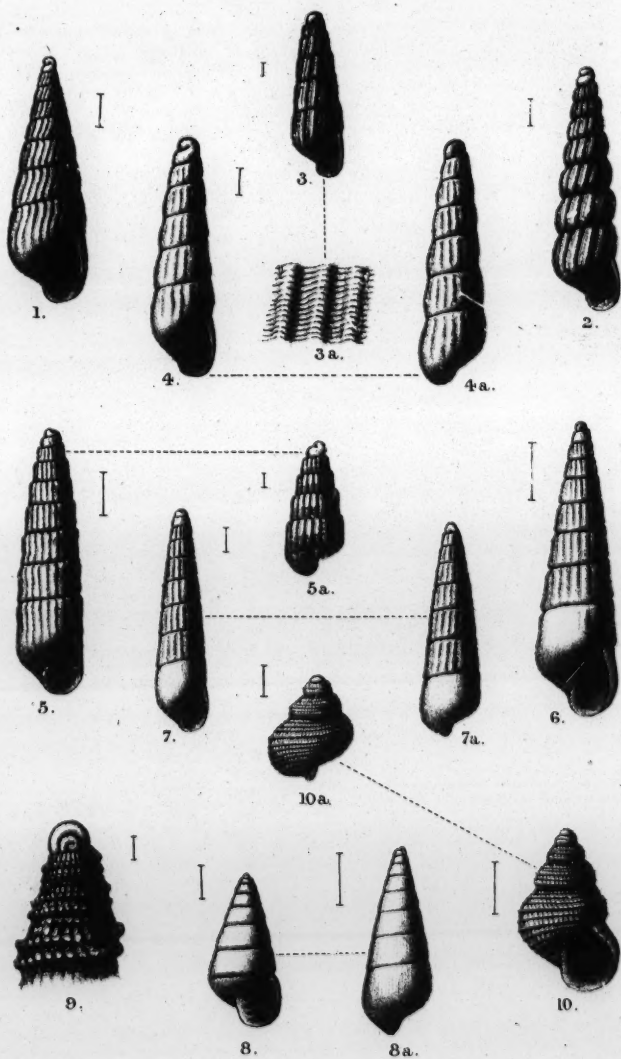
In the species from shallow water the eyes are invariably well developed, and show a general resemblance in structure to the eyes of other Isopoda, but at the same time present certain peculiarities: the retinula is made up of only four cells, which is an unusually small number, five or seven being most commonly met with; each of these cells is somewhat hatchet-shaped, and the anterior ends are closely applied together beneath the vitreous body; the lower portion of the retinal cell is elongated, and at about the middle is an oval thickening where the nucleus is situated. In *Serolis paradoxa* at least each retinal cell secretes a highly refractive body (phaosphere) which may be placed in front of, behind, or to one side of the nucleus. Each of the retinal cells secretes in addition a delicate chitinous rod, the rhabdomere or sehstäbchen; the four rhabdomeres are closely united to form the rhabdom, which differs in structure in different types. In *S. schythei*, *S. paradoxa*, and *S. latifrons* the rhabdom is a comparatively small conical body terminating below in a fine thread, which is prolonged backwards nearly as far as the pigmented membrane which bounds the posterior surface of the eye. In *Serolis cornuta* the rhabdom is more complicated, and has much the appearance of one of the Malpighian tufts of the kidney, from the arrangement of the chitinous rods which compose it into an irregular coil massed round a central piece; the interstices between the rods of which it is composed are filled with pigment, and the central piece is prolonged into a fine thread.

So far the eye of *Serolis* only differs in detail from that of other Isopoda, but there is another structure present, which does not appear to have been described in any other Arthropod, and certainly does not exist in any that I have examined myself. Between the retinal cells, and close to their upper extremity, are two large hyaline bodies nearly as large as the vitreous body, and presenting much the same

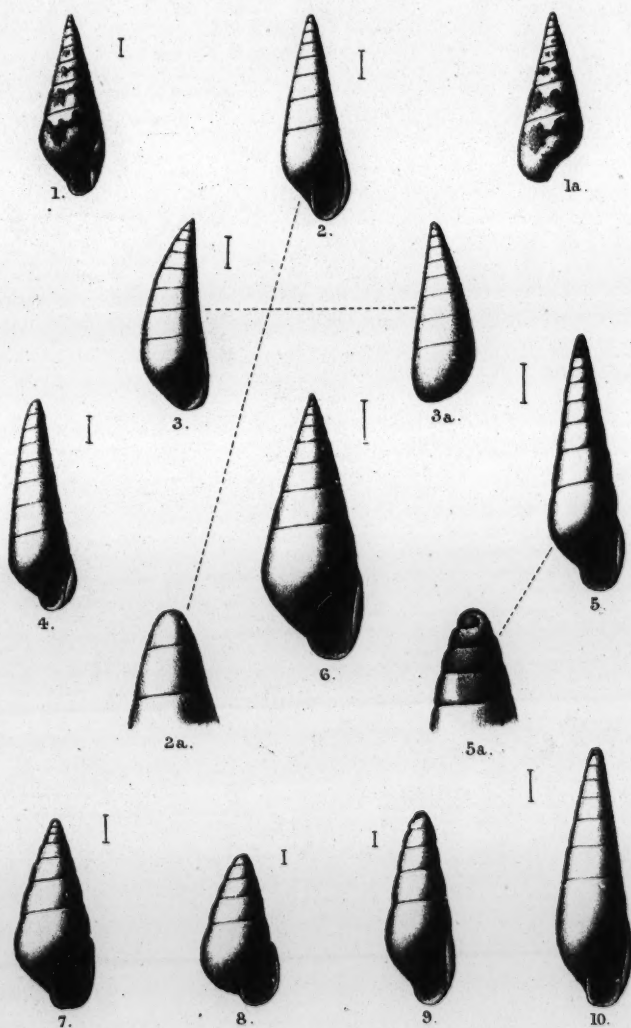












C. Berjeau del et lith.

Mintern Bros. imp.

MOLLUSCA OF THE "LIGHTNING" AND  
"PORCUPINE" EXPEDITIONS.

appearance, only that they are nearly colourless; at the lower end of each is an irregularly shaped nucleus. The lower end of the rhabdom projects into their substance; the large size and transparency of these cells seems to indicate that they serve as dioptric media.

2. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. (Part VIII.) By J. GWYN JEFFREYS, LL.D., F.R.S., F.Z.S.

[Received April 30, 1884.]

(Plates XXVI.-XXVIII.)

GASTROPODA (*continued*).

Family XVI. ACLIDÆ.

Apex having a dextrorsal and involute spire.

CIONISCUS<sup>2</sup>, Jeffreys.

SHELL cylindrical, striated or fluted lengthwise, and sometimes reticulated: *spire* elongated; apex blunt and twisted: *mouth* oval, contracted.

Differs from *Aclis* in the sculpture, apex, and shape of the mouth.

In 'British Conchology' (vol. iv. p. 102) I proposed the generic name *Graphis* for the only species which was then known, viz. *Turbo unicus* of Montagu, which may be considered the type of the present genus; but I afterwards (vol. v. p. 210) substituted *Cioniscus* for *Graphis*, finding that the latter name had been long previously used by botanists for a genus of Lichens. Out of the four species now known, one of them (*C. unicus*) inhabits the littoral and laminarian zones, all the other species being deep-water or abyssal.

1. CIONISCUS GRACILIS<sup>3</sup>, Jeffreys. (Plate XXVI. fig. 1.)

SHELL of nearly equal breadth throughout, thick, semitransparent, and glossy: *sculpture*, numerous sharp and flexuous longitudinal ribs, which extend to the base; there are about 25 on the last whorl; each whorl is angulated or shouldered at the top; the first whorl and a half, which form the apex, are marked by two slight spiral striæ, but are otherwise smooth and polished: *colour* whitish, with a faint tinge of yellowish-brown: *spire* very gradually tapering to a blunt and apparently truncated point; apex somewhat inflected: *whorls* 5½, convex, but rather compressed: *suture* deep: *mouth* somewhat

<sup>1</sup> For Part I. see P. Z. S. 1878, p. 393; for Part II. see P. Z. S. 1879, p. 553; for Part III. see P. Z. S. 1881, p. 693; for Part IV. see P. Z. S. 1881, p. 922; for Part V. see P. Z. S. 1882, p. 656; for Part VI. see P. Z. S. 1883, p. 87; and for Part VII. see P. Z. S. 1884, p. 111.

<sup>2</sup> Resembling a little pillar; from *κίων*, columna, and *ἴσσω*, assimulo.

<sup>3</sup> Slender.

more round than oval; peristome continuous or complete: *outer lip* flexuous, usually strengthened by a rib, contracted above: *inner lip* attached to the pillar, which is oblique; there is no umbilicus. L. 0.1. B. 0.025.

'Porcupine' Exp. 1870: Atl. St. 17a, 26-30, 33; Med. 55.

*Distribution.* Bay of Biscay ('Travailleur' Exp.), Tunisian coast (Nares and Dautzenberg), S. Vito (Monterosato), off the west coast of Africa and the Azores ('Talisman' Exp.); 108-1622 fms.

*Fossil.* Pliocene: Messina (*Seguenza*).

## 2. CIONISCUS STRIATUS<sup>1</sup>, Jeffreys. (Plate XXVI. fig. 2.)

*SHELL* forming an elongated column, thin, semitransparent, and glossy: *sculpture*, close-set, thread-like, and flexuous longitudinal ribs, about twice as many as in the last species; they do not extend to the base of the shell; one at least of these ribs is varicose or larger and thicker than the rest; there are slight indications of spiral striae under the microscope; the two apical whorls are quite smooth or polished: *colour* whitish: *spire* elegantly and gradually tapering to a blunt and bulbous point: *whorls* 8, convex and rounded: *suture* deep and well defined: *mouth* roundish-oval; lips disunited: *outer lip* contracted at the upper corner: *inner lip* adhering to the pillar and resembling a thin glaze: *umbilicus* none, but the base is somewhat depressed. L. 0.15. B. 0.05.

'Porcupine' Exp. 1870: Atl. St. 16. Four more or less perfect specimens.

*Distribution.* Tunisian coast (Nares), off the Sahara and west coast of Africa ('Talisman' Exp.); 300-1261 fms.

In the last 'Talisman' Expedition occurred another species of *Cioniscus*, which will be named and described by Dr. Fischer or the Marquis de Folin. It is larger than either of the species now described; the ribs are straight, and do not extend below the periphery; and the mouth is longer.

## 1. ACLIS ASCARIS, Turton.

*Turbo ascaris*, Turt. Conch. Dict. p. 217.

*A. ascaris*, B. C. iv. p. 102; v. p. 210, pl. lxxii. fig. 2.

'Porcupine' Exp. 1869: St. 2, 18. 1870: Med. Adventure Bank.

*Distribution.* W. & S. Norway to Crete; 15-120 fms. Occurs with *A. supranitida*, but both species have been apparently confounded in local catalogues. The present species is much smaller and narrower; and it has no umbilicus. *A. supranitida* is larger, and more conical or wider at the base; and the umbilicus is very conspicuous in every state of growth. A specimen of *A. ascaris*, which was found by the late Mr. Robert Dawson in shell-sand from St. Magnus Bay, Shetland, has a variciform rib.

*Fossil.* Pliocene: Coralline Crag, Pisa (*Manzoni*), Tuscany (*De Stefani*).

There are some doubtful and obsolete synonyms of v. Muhlfield and others.

<sup>1</sup> Fluted.

2. *ACLIS SUPRANITIDA*, S. Wood.*Alvania supranitida*, S. Wood, Cat. Crag. Moll. 1842.*Actis supranitida*, B. C. iv. p. 103, pl. ii. fig. 4.

'Porcupine' Exp. 1869: St. 18, Donegal Bay (fine and living specimens), N. Channel. 1870: Atl. Vigo Bay; Med. 30, 55, Adventure Bank.

*Distribution.* W. Norway to the Mediterranean and Adriatic, Madeira and Canaries (*McAndrew*); 8-108 fms.*Fossil.* Pliocene: Coralline Crag and Italy. Post-tertiary: Norway (*Crosskey* and *Robertson*), Belfast (*Stewart*).The synonyms are referable not only to *Actis*, but also to *Turritella*, *Alvania*, and *Pyramis*, with various specific names; for these see 'British Conchology.'The following is an extract from my note-book as to the Donegal Bay specimens:—"BODY clear white, with a pink streak down the middle: *mantle* rather thin: *snout* or mentum bilobed in front: *tentacles* triangular (being a modification of those in *Odostomia*), with blunt tips: *eyes* 2, black, small, sessile on the head at the inner base of the tentacles: *foot* elongated, squarish in front and pointed behind: *operculum* thin, striated in the line of growth; spire small, placed close to the inner or pillar lip."

Sculpture of the shell very variable, sometimes altogether wanting.

3. *ACLIS WALLERI*, Jeffreys.*A. walleri*, B. C. iv. p. 105; v. p. 210, pl. lxxii. fig. 4.

'Porcupine' Exp. 1869: St. 15, 19, 36, 47. 1870: Atl. 3, 6, 9, 16, 17, 17a; Med. Adventure Bank.

*Distribution.* 'Vöringen' Arctic Expedition and Loffoden Isles to the Gulf of Egina, New England (*Verrill*), off C. Verd I. ('*Talisman*' Exp.); 10-1192 fms.*Fossil.* Pliocene: Coralline Crag, Calabria, and Sicily.*Synonyms.* *A. terebralis*, M. Sars, MS., var. *minor* as *A. exigua*, G. O. Sars, and *Odostomia nisoides*, Brugnone. Monterosato prefers to spell the specific name "*valleri*"; but it is evident that, although there is no letter W in the Latin language, it would not be right to alter the name in order to put it into a classical dress, and the identification of *valleri* with the name of the discoverer of the present species would be lost.This pretty shell is very variable in size as well as in sculpture. Some specimens from the 'Porcupine' Expedition of 1870 show indistinct traces of spiral ridges on the last whorl and of longitudinal ribs on the upper whorls, while others have a slight keel on the periphery. But not one of these characters is constant. M. Bourguignat, indeed, says, in his second letter to Professor Brusina ('Lettres malacologiques,' Paris, 1882, pp. 36-38), "*La nouvelle école distingue donc, sur un nom spécial, toute forme ayant des caractères constants, pourvu que ses caractères soient au nombre de trois. Au-dessous de ce nombre elle rejette les formes au rang de variété.*" The words italicized are similarly emphasized in the

original. Upwards of forty years ago the late Edward Forbes proposed to distinguish species in the same way. But it is notorious that the relative value and constancy of these characters have yet to be determined, and that there is no standard of reference by which naturalists can be guided in adjudging some forms to be species and others to be varieties in different genera. Every naturalist, whether of the old or the "new" school, must form his own opinion. I have already, in the first chapter of the introduction to my work on 'British Conchology' (pp. 18-19, 23), fully stated my views on this difficult and hitherto unsettled question.

In the present species the apical whorls are pinched up and narrower than the rest of the spire; the mouth in perfect specimens resembles that of *Pherusa gulsonæ*.

#### 4. *ACLIS VENTROSA*, Jeffreys.

*A. ventrosa* (Jeffr.), Friele, Bidrag til Vestlandets Molluskfauna (Vid. Forh. 1875, separate copy), p. 5, t. i. f. 7, 7a, 7b.

'Porcupine' Exp. 1869: St. 23a. 1870: Atl. 16.

*Distribution.* Lofoten I. (G. O. Sars), Bergen (Friele); 200-300 fms.

More conical and broader at the base, and with the whorls more rapidly increasing, than *A. walleri*. It belongs to the genus *Hemiaclis* of G. O. Sars.

#### *PHERUSA GULSONÆ*, Clark.

*Chemnitzia gulsonæ*, Clark in Ann. & Mag. Nat. Hist. 3rd ser. vi. p. 459.

*Aclis gulsonæ*, B. C. iv. p. 106; v. p. 210, pl. lxxii. f. 5.

'Porcupine' Exp. 1870: Atl. St. 27, 28. Fragments only.

*Distribution.* British and Irish coasts from Shetland to Guernsey, Vigo Bay (McAndrew), Palermo (Monterosato), Madeira (Watson); 20-103 fms.

*Fossil.* Pliocene; Coralline Crag, Sutton (S. Wood).

See 'British Conchology' for the description of the animal and shell, which shows the peculiar characters of this mollusk. I had there suggested the generic name *Menippe*; but as that name had been previously employed in the Crustacea, I venture to substitute *Pherusa*, which was at one time given to it by Mr. Clark, the discoverer of the shell. I cannot explain the meaning of this name.

### FAMILY XVII. PYRAMIDELLIDÆ.

Apex having a sinistrorsal and exposed spire.

It is unnecessary, if not a waste of time, to recapitulate the facts and arguments which I used in 'British Conchology' (vol. iv. pp. 108-111) for the purpose of proving that the subdivision of *Odotomia* into several genera is really unscientific, and is not based on a single valid character. The presence of a "tooth" or columellar fold, the length of the spire, and the kind of sculpture (if any) are so variable, that it is quite impossible to distinguish or separate certain

species which might else be treated as mere varieties of other species. I shall be pleased if my brother conchologists will take the trouble to read the observations which I have to make in the course of the following pages, and will consider the question impartially and without regard to preconceived notions. In corroboration of my opinion that the presence or absence of a "tooth" or columellar fold does not of itself constitute a generic character, I would refer to some judicious remarks by Dr. Fischer in the 'Journal de Conchyliologie' for 1865.

I may take this opportunity of noticing, par parenthèse, that Philippi, in his generally useful 'Handbuch' (1853), gave *Odotomia* of Fleming as a synonym of *Rissoa*!

A. Typical. Smooth or variously sculptured, and always dentated.

1. *ODOSTOMIA ELECTA*, Jeffreys.

*O. electa*, Proc. Zool. Soc. 1883, p. 394, pl. xliv. f. 3.

'Porcupine' Exp. 1869: St. 4. A single but perfect specimen.

*Distribution*. Between the Hebrides and Faroes ('Triton' cruise); 516 fms.

Allied to *Liostomia eburnea* of G. O. Sars; but, besides being very much smaller, the apex of the spire in the present species is abruptly and obliquely truncated, and the suture is not excavated as in the other species.

2. *ODOSTOMIA CLAVULA*, Lovén.

*Turbonilla clavula*, Lov. Ind. Moll. Scand. p. 18.

*O. clavula*. B. C. iv. p. 118; v. p. 211, pl. lxxiii. f. 1.

'Porcupine' Exp. 1869: St. 2, 18. 1870: Atl. Vigo B, 13.

*Distribution*. Lofoten I. to Smyrna; 6-163½ fms.

*Fossil*. Pliocene: Calabria and Sicily.

A variety appears to be *O. pistillus*, afterwards *pistilliformis* of Brugnone.

This species is always distinguishable by having the shape of a short cylinder with a truncated apex.

3. *ODOSTOMIA SUBOBLONGA*<sup>1</sup>, Jeffreys. (Plate XXVI. fig. 3.)

SHELL conic-oblong, of moderate thickness, semitransparent, and glossy: *sculpture* none except a slight keel which encircles the periphery in young and half-grown specimens, and gives them a somewhat angular appearance: *colour* ivory-white: *spire* shortish; nucleus not prominent, and twisted inwards: *whorls* 4-5, slightly compressed but not flattened, gradually enlarging; the last equals two thirds of the spire when the shell is placed with the mouth upwards: *suture* shallow: *mouth* pear-shaped, somewhat contracted above and expanded below; its length is between one half and two fifths of the spire; inside smooth: *outer lip* rather thick-edged: *inner*

<sup>1</sup> Somewhat oblong.

lip spread on the pillar and continuous with the outer lip; there is no umbilicus or chink: *tooth* sunken, mostly observable in half-grown specimens. L. 0.1. B. 0.05.

'Porcupine' Exp. 1869: St. 4. 1870: Atl. 9, 13, 26-34; Med. 40, 55, Adventure Bank.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1880 & 1881), off the Tunisian coast (*Nares*), Messina (*Granata*), off C. Verd. I. ('Talisman' Exp.); 30-1192 fms.

By comparing the above description of this species with those of other species belonging to the present section which are given in the fourth volume of 'British Conchology,' the difference will be easily seen. Some conchologists, for whose opinion I have a great esteem, believe that I have too much restricted the number of species; but I have conscientiously endeavoured to preserve the "juste milieu" in that respect.

#### 4. ODOSTOMIA UNIDENTATA, Montagu.

*Turbo unidentatus*, Mont. Test. Brit. (ii.) p. 324.

*O. unidentata*, B. C. iv. p. 134; v. p. 211, pl. lxxiv. f. 1.

'Lightning' Exp. St. 2, 4, 5 (var. *elata*).

'Porcupine' Exp. 1869: St. 2. 1870: Atl. 3a, 9, off C. Sagres, Tangier B.; Med. Benzert Road.

*Distribution.* Iceland, Hammerfest and Vadsö to the eastern coasts of the Mediterranean, western coasts of Africa ('Talisman' Exp.), Canaries and Madeira, Pernambuco ('Challenger' Exp.); 10-777 fms.

*Fossil.* Pliocene: Red Crag, Calabria; Post-tertiary: Norway, Scotland, and Ireland; 8-460 ft. Not *O. unidentata* of Philippi from the Tertiaries of N.W. Germany.

Besides the synonyms given in 'British Conchology,' I would observe that *O. monterosatoi* of the learned authors of the marine mollusca of Roussillon appears to be the young of the present species, judging from typical specimens kindly submitted by M. Dautzenberg to my examination.

#### 5. ODOSTOMIA TURRITA, Hanley.

*O. turrita*, Hanl. in Proc. Z. S. pt. xii. p. 18: B. C. iv. p. 135, v. p. 211, pl. lxxiv. f. 2.

'Lightning' Exp. St. 4, 5.

'Porcupine' Exp. 1870: Med. 55, Adventure Bank (var. *nana*).

*Distribution.* Vadsö and Lofoten I. to Hydra Channel in the Gulf of Egina and the Adriatic, Madeira and Teneriffe (var. *nana*), Pernambuco ('Challenger' Exp.); 0-350 fms.

*Fossil.* Post-tertiary: Norway and Lochgilp (*Crosskey* and *Robertson*); 3-240 ft.

*O. turriculata* of Monterosato seems to be another variety of this species.

Mr. Pidgeon observed this species at Torquay feeding on the polyparies of a *Lepralia*.

6. *ODOSTOMIA ACUTA*, Jeffreys.

*O. acuta*, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 338; B. C. iv. p. 130; v. p. 211, pl. lxxiii. f. 8.

'Porcupine' Exp. 1870: Med. St. 50, Benzert Road, Adventure Bank (dwarf variety).

*Distribution*. Lofoten I. to E. Mediterranean and the Adriatic, Canaries and Teneriffe; 0-120 fms.

*Fossil*. Pliocene: Coralline and Red Crag, and Sicily. Post-tertiary: Belfast and Selsea.

Clark was right in saying that the throat was grooved in some specimens. I have one of this kind which was dredged by Mr. Verkrüzen at Falmouth. Mr. Pidgeon remarks in his letter to me of the 9th November, 1874, that this species is "most abundant at Torquay, under stones at low water, spring-tides, but never unless associated with tubes of *Serpula*. To-day I found one stone which was crowded with them, nestling among the tubes; neighbouring stones could not show a specimen, if they were free from *Serpula*."

7. *ODOSTOMIA CONOÏDEA*, Brocchi.

*Turbo conoideus*, Broc. Conch. Foss. Subap. ii. p. 659, t. xvi. f. 2.

*O. conoïdea*, B. C. iv. p. 127; v. p. 211, pl. lxxiii. f. 6.

'Porcupine' Exp. 1869: St. 2, 13, 18. 1870: Atl. 6, 10, Vigo B., Setubal B., C. Sagres, 30; Med. off Jijeli, Benzert Road, Rasel Amoush, G. Tunis, Adventure Bank. Nearly all the specimens belong to the variety *australis*, a few to an intermediate form.

*Distribution*. Hammerfest to the Archipelago and Adriatic; ? Red Sea (*Philippi*); 0-130 fms.

*Fossil*. Miocene, Pliocene, and Post-tertiary: throughout Europe and Rhodes.

The synonyms are numerous. I have noted eleven, including *Rissoa polita* of Scacchi, *Odontostoma sicula* of Philippi, *Eulima monodon* of Requier, *Odostomia nagli* and *O. sismondæ* of Seguenza.

My friend the Marquis de Folin found a monstrous specimen on the northern coast of Spain which has a complete peristome.

8. *ODOSTOMIA TENUIS*<sup>1</sup>, Jeffreys. (Plate XXVI. fig. 4.)

SHELL oblong, slender, rather thin, nearly transparent, and glossy: *sculpture* none except exceedingly fine and close-set lines of growth, which are observable only under a microscope: *colour* whitish: *spire* elongated; apex or nucleus rather prominent: *whorls* 6, somewhat compressed, gradually enlarging; the last equals three fifths of the spire with the mouth placed upwards; *suture* rather shallow: *mouth* oval, slightly contracted above, curved below; its length does not much exceed one third of the shell; the inside is marked with half a dozen short grooves or striæ in the direction of the spire, which are distinctly seen through the shell: *outer lip* sharp: *inner lip* folded back on the pillar and continuous with the

<sup>1</sup> Slender or slim.

outer lip; there is no umbilicus or chink: *tooth* small but conspicuous. L. 0.1. B. 0.05.

'Porcupine' Exp. 1870: Med. St. 55, Adventure Bank.

*Distribution.* Brittany (*Cailliaud*), G. Tunis (*Nares*); 50-100 fms.

Differs from *O. conoidea* in being very much smaller, as well as slender and narrow, instead of conical and angulated. The labial grooves are fewer in number and confined to the front; in *O. conoidea* these are more numerous and prolonged. And the present species has no umbilicus or chink.

#### 9. ODOSTOMIA ALBELLA, Lovén.

*Turbonilla albella*, Lov. Ind. Moll. Scand. p. 19.

*O. albella*, B. C. iv. 121; v. p. 211, pl. lxxiii. f. 1.

'Porcupine' Exp. 1870: Atl. St. Tangier B., Gibraltar.

*Distribution.* Hammerfest to Algiers, Sicily, and the Adriatic, Madeira (*Watson*); 0-40 fms.

*Fossil.* Post-tertiary: Norway, Sweden, and Caithness; 40-100 ft.

#### 10. ODOSTOMIA RISSOIDES, Hanley.

*O. rissoides*, Hanley, in P. Z. S. pt. xii. p. 18: B. C. iv. p. 122; v. p. 211, pl. lxxiii. f. 4.

'Lightning' Exp. St. 5.

'Porcupine' Exp. 1870: Atl. 13, 30 (var. *exilis*).

*Distribution.* Christiania, Bohuslän, Baltic, Danish coasts, North Sea, Great Britain and Ireland, N. and W. France and Spain, Mediterranean and Adriatic, off the West of Africa ('*Talisman*' Exp. 1883), Madeira (*Watson*); 0-777 fms. The variety *dubia* was dredged in the 'Challenger' Expedition off Prince Edward Island in 50-150 fms.

*Fossil.* Pliocene: Calabria and Sicily.

This common and variable species is apparently *Rissoa glabra* of Brown, *O. scalaris* of Macgillivray (a name, however, preoccupied by Philippi), *Turbonella transparens* of Leach; and I consider the variety *dubia* to be *O. edwardi* of Watson. *Helix resupinata* of Montagu from Walker's figure 24 was probably the fry of the present species.

#### 11. ODOSTOMIA PALLIDA, Montagu.

*Turbo pallidus*, Mont. Test. Br. (ii.) p. 325, t. 21. f. 4.

*O. pallida*, B. C. iv. p. 124; v. p. 211, pl. lxxiii. f. 5.

'Porcupine' Exp. 1870: Atl. St. Vigo B., Tangier B.

*Distribution.* Bodö in arctic Norway to the Gulf of Egina and the Adriatic; 2-250 fms.

*Fossil.* Pliocene: Pisa, Calabria, and Sicily. Post-tertiary: Belfast, Clyde Beds, and Sicily.

For the rather numerous synonyms see 'British Conchology,' and add *O. novegradensis* of Brusina.

The peculiar habitat of this species is the "ears" of *Pecten opercularis* and *P. maximus*. There are several varieties.

12. *ODOSTOMIA NITENS*, Jeffreys. (Plate XXVI. fig. 5.)

*O. nitens*, Jeffr. in Ann. & Mag N. H. July 1870, p. 79.

'Porcupine' Exp. 1869: St. 15. 1870: Atl. 3, 8, 9, 27, 28; Med. Adventure Bank.

*Distribution*. Palermo (*Monterosato*), Ægean (*Spratt*), Adriatic (*Brusina*), Fayal ('Challenger' Exp.); 130-450 fms.

Differs from *O. (Synnola) minuta* of A. Adams, which is cylindrical, and has more whorls as well as a golden band encircling the periphery, and a strong tooth. In the present species the tooth is represented by a broad but not conspicuous fold on the pillar. The peristome is entire or continuous; operculum of a pale yellow colour. It varies greatly in size, from 0.15 to 0.075 in length, and proportionably in breadth.

*O. erjaveciana* of Professor Brusina.

13. *ODOSTOMIA DIAPHANA*, Jeffreys.

*O. diaphana*, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 341: B. C. iv. p. 141; v. p. 212, pl. lxxiv. f. 5.

'Porcupine' Exp. 1870: Med. St. Adventure Bank. A small and slender variety.

*Distribution*. Bergen to the eastern coasts of the Mediterranean and the Adriatic; 12-80 fms.

*Fossil*. Pliocene: Sicily.

14. *ODOSTOMIA INSCULPTA*, Montagu.

*Turbo insculptus*, Mont. Test. Br. Suppl. p. 129.

*O. insculpta*, B. C. iv. p. 139; v. p. 211, pl. lxxiv. f. 4.

'Lightning' Exp. St. 4, 5.

'Porcupine' Exp. 1870: Atl. Vigo B., 26.

*Distribution*. Iceland and Lofoten I. to the Bay of Biscay; 10-586 fms.

*Fossil*. Pliocene: Coralline Crag, Ficarazzi (*Brugnone*). Post-tertiary: Norway (*Croskey* and *Robertson*); 0-100 ft.

*Turbonilla obliqua*, Lovén (ex spec. Örsted).

15. *ODOSTOMIA FLICATA*, Montagu.

*Turbo plicatus*, Mont. Test. Brit. (ii.) p. 325, t. 21, f. 2.

*O. plicata*, B. C. iv. p. 137; v. p. 211, pl. lxxiv. f. 3.

'Porcupine' Exp. 1870: Med. St. Adventure Bank (semi-fossilized).

*Distribution*. Bergen (*Friele*) to Sicily and the Adriatic, Madeira (*McAndrew*): 0-120 fms.

*Fossil*. Pliocene: Coralline and Red Crag, Biot, and Italy. Post-tertiary: Selsea. Not *Odontostoma plicatum* of Hörnes, a Miocene fossil.

*Eulima bulimus* of Scacchi, *Rissoa elongata* of Philippi, *O. fusulus* of Monterosato, and other synonyms. Not *O. vitrea* of Brusina, as

stated in 'British Conchology'; that is *O. neglecta* of Tiberi, and I was misled by observing in the collection of the late M. Petit, at Paris, specimens of the present species under the name of *O. vitrea*.

16. *ODOSTOMIA PRÆLONGA*<sup>1</sup>, Jeffreys. (Plate XXVI. fig. 6.)

SHELL obelisk-shaped, thin, semitransparent, and very glossy: *sculpture* none: *colour* clear white: *spire* long and elegantly tapering; apex or nucleus rather blunt: *whorls* 10, more or less compressed: *suture* slight, usually rather oblique: *mouth* squarish-oval, somewhat inflected above and curved below: *outer lip* thin and flexuous, smooth within: *inner lip* so filmy as to be scarcely perceptible: *umbilicus* none: *tooth* small but distinct. L. 0.275. B. 0.075.

'Porcupine' Exp. 1870: Atl. St. 13, 17a, 24, 27-30, 32-34, 36; Med. 50, 55, Adventure Bank. Many specimens of various sizes; those from the Mediterranean are much smaller and more slender.

From the Adventure Bank Station I have an imperfect specimen and some fragments of apparently another species allied to the present. It has a thick shell with an angular periphery and a straight pillar, a slighter and straighter suture, and a smaller tooth. If more specimens should be found this may be named *concinna*.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1880 and 1881), Coralline zone, Sciaccha (*Monterosato*), Algiers (*Joly*), E. Mediterranean (*Nares*), off West coast of Africa ('Talisman' Exp. 1883); 20-733 fms.

I noticed this species in the Reports of the British Association for 1873, p. 112. If it were not for the conspicuous tooth, it would certainly be placed in the so-called genus *Eulimella*.

17. *ODOSTOMIA CRASSA*<sup>2</sup>, Jeffreys. (Plate XXVI. fig. 7.)

SHELL cylindrical, remarkably thick and strong, opaque, and glossy: *sculpture* none, except microscopic lines of growth and the grooves with the outer lip hereafter mentioned, as well as the periphery being slightly angulated: *colour* ivory-white: *spire* long and finely tapering: *whorls* 5 only in the fragments now described, although there would be from 8 to 10 in perfect specimens; they gradually increase in size and are flattened: *suture* slight, rounded below: *outer lip* incrassated, furnished inside with 8 to 10 spiral striae or flutings, like those in *O. conoidea*, *O. tenuis*, and *O. conspicua*, as also in *O. costaria* and other Crag species: *inner lip* forming an unusually thick and broad glaze on the pillar: *umbilicus* none: *tooth* large, solid, prominent, and winding round the pillar. Largest fragment L. 0.25, B. 0.085.

'Porcupine' Exp. 1870: Atl. St. 3, 6, 9, 26; Med. Adventure Bank. Many characteristic fragments of as many specimens of this curious species. Its general aspect reminds one of *O. scillæ*; but the strong tooth and the inside fluting of the outer lip at once serve to distinguish the two species.

<sup>1</sup> Very long.

<sup>2</sup> Thick.

## 18. ODOSTOMIA UNIFASCIATA, Forbes. (Plate XXVI. fig. 8.)

*Eulima unifasciata*, Forb. Rep. Æg. Inv. (Rep. Brit. Assoc. 1843), p. 188.

'Porcupine' 1870: Med. St. Adventure Bank.

*Distribution*. Bay of Biscay ('Travailleur' Exp.), throughout the Mediterranean, off the Sahara and Azores ('Talisman' Exp.), New England (Verrill); 30-1622 fms.

Forbes's description is as follows:—" *Eulima unifasciata*, sp. nov. E. testâ turrîtâ, lævigatâ, politâ, albâ, fasciâ fulvâ cinctâ: anfractibus 11 planiusculis; aperturâ ovatâ. Long  $0\frac{1}{2}$  unc. Lycia. Reg. viii." This description was evidently intended for the shell which is now figured, although the tooth must have escaped his notice; this was also the case with several species of *Odostomia*, described by Philippi as *Rissoa*.

The mouth is angular or sharply pointed above and below. A specimen from the Gulf of Naples, which has a conspicuous band and tooth, shows also a grooved or crenated mouth.

It is the *Eulimella smithii* of Verrill.

## 19. ODOSTOMIA MINUTA, H. Adams.

*Syrnola minuta*, H. Ad. in P. Z. S. 1869, p. 274, pl. xix. f. 10.

'Porcupine' Exp. 1870: Atl. St. 14, 30; Med. Adventure Bank.

*Distribution*. Bay of Biscay ('Travailleur' Exp. 1882), Mediterranean (Susini, Monterosato, Spratt, 'Shearwater' Exp. and 'Washington' Exp.), Orotava (McAndrew); 54-249 fms.

*Fossil*. Pliocene: Altavilla (Brugnone).

*O. macella*, Brugnone.

The operculum is of a pale yellowish colour. The coloured band is not always present. I do not know what character justified the separation of this species as a distinct genus, nor what is meant by the name *Syrnola*.

B. Striated lengthwise or reticulated, and dentated.

## 20. ODOSTOMIA TRICINCTA, Jeffreys.

*O. tricincta*, Jeffr. in Ann. & Mag. N. H. Febr. 1856, p. 185, pl. ii. f. 12, 13.

'Porcupine' Exp. 1870: Med. St. off Rinaldo's Chair.

*Distribution*. N.W. France (Cailliaud), Mediterranean and Adriatic, Canaries (McAndrew), and Madeira (Watson); 25-120 fms.

*Fossil*. Pliocene: Monte Pellegrino, Sicily (Monterosato).

Variable in size. It may possibly have been the *Rissoa doliolum* of Philippi; but his description and figure show no coloured band nor the tooth-like fold on the pillar, and the ribs are fewer in that species. Some specimens of the present species have only two bands. *O. tricincta* was apparently figured in Savigny's unfinished work, 'Histoire Naturelle de l'Égypte,' 1805-12, but it was never described or even named.

21. *ODOSTOMIA EXCAVATA*, Philippi.*Rissoa excavata*, Phil. Moll. Sic. i. p. 154, t. x. f. 6.*O. excavata*, B. C. iv. p. 158; v. p. 213, pl. lxxv. f. 6.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 26; Med. 55.

*Distribution.* Great Britain and Ireland, N. and W. France and Spain, Mediterranean and Adriatic; 5-600 fms.*Fossil.* Pliocene: Coralline Crag, Italy, and Rhodes. Post-tertiary: Largs, Ayrshire (*Landsborough*); 5-10 ft.*Rissoa trinodosa* of Rayneval, besides the synonyms given in 'British Conchology.'22. *ODOSTOMIA HUMBOLDTI*, Risso.*Turbonilla humboldti*, Risso, Hist. Nat. de l'Eur. mér. 1826, t. iv. (Suppl.) p. 394, f. 63.

'Porcupine' Exp. 1870: Atl. St. Tangier B.; Med. 50, 50a, off Jijeli, G. Tunis.

*Distribution.* Mediterranean and Adriatic (*Risso*, *Stossich*, and others), Madeira (*Watson*); 15-120 fms.*Fossil.* Miocene: Vienna and Bordeaux Basins. Pliocene: Nice and Italy. Post-tertiary: Leghorn and Pozzuoli.

There are several obsolete and useless synonyms.

*O. humboldti* has a tooth-like fold on the pillar, placed differently from that in *Menestho* and *Actæon* or *Tornatella*, to which genera this species has been assigned by some conchologists.23. *ODOSTOMIA DECUSSATA*, Montagu.*Turbo decussatus*, Mont. Test. Br. (ii.) p. 322, t. 12, f. 4.*O. decussata*, B. C. iv. p. 145; v. p. 212, pl. lxxiv. f. 8.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 36.

*Distribution.* Shetland to Guernsey, N. and W. France, Algiers, and Sicily; 12-70 fms.*Fossil.* Pliocene: Coralline Crag, Monte Mario, and Sicily.*Helix arenaria* of Maton and Rackett, ? *Pyramis spirolinus* of Brown.24. *ODOSTOMIA EXIMIA*, Jeffreys.*Rissoa eximia*, Jeffr. in Ann. & Mag. N. H. new ser. iv. p. 299.*O. eximia*, B. C. iv. p. 155; v. p. 213, pl. lxxv. f. 4.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: 23a.

*Distribution.* Vadsö and Hammerfest to Shetland and the Minch in Ross-shire; 10-100 fms.*Fossil.* Post-tertiary: Christiania (*Sars*); 100 ft.Not *Turbonilla eximia* of A. Adams from Japan.25. *ODOSTOMIA SPIRALIS*, Montagu.*Turbo spiralis*, Mont. Test. Br. (ii.) p. 323, t. 12, f. 9.*O. spiralis*, B. C. iv. p. 154, pl. ii. f. 5; v. p. 213, pl. lxxv. f. 3.

'Porcupine' Exp. 1870: Atl. St. 3, Vigo B.; Med. 50.

*Distribution.* Öxfjord and Finmark to the Mediterranean and Adriatic; 8-40 fms.

*Fossil.* Pliocene: Leghorn and Monte Mario. Post-tertiary: Norway, W. Scotland, and Portrush; 3-460 ft.

A few obsolete synonyms.

As to the specific name *spiralis*, Monterosato says "poco corettamente da alcuni *spirialis*." Neither word is Latin, much less classical; *spirula* would be better.

## 26. ODOSTOMIA INTERSTINCTA, Montagu.

*Turbo interstinctus*, Mont. Test. Br. (ii.) p. 324, t. 12. f. 10.

*O. interstincta*, B. C. iv. p. 151; v. p. 213, pl. lxxv. f. 2.

'Lightning' Exp. St. 4.

'Porcupine' Exp. 1870: Atl. C. Sagres (var. *multicostata*), 26 (var. *suturalis*), Tangier B. (typical); Med. 50, Benzert Road, Rasel Amoush (typ. and var. *suturalis*, from the last three stations).

*Distribution.* Lofoten Isles and the western and southern coasts of Norway to the Mediterranean and Adriatic, Canaries and Madeira; 3-310 fms.

*Fossil.* Miocene: Vienna Basin (*Hörnes*), and Adour (*Grateloup*). Pliocene: Coralline and Red Crag, Pisa (*Manzoni*), Siena (*de Stefani* and *Pantanelli*), Monte Mario (*Rigacci*), Sicily (*Philippi* and others). Post-tertiary: Norway, West Cheshire, and Selsea; 8-240 ft.

The principal synonyms for varieties are *Chevnitzia terebellum*, *Rissoa gracilis* and *R. suturalis* of Philippi, and *O. moulinsiana* of Fischer.

This abundant and widely diffused species is of course extremely variable, and especially with respect to dimensions and the number of ribs. Other naturalists must exercise their own judgment as to considering *O. terebellum* or *moulinsiana* and *O. suturalis* alias *emaciata* or *sylvestri* or *penchinati*, as well as other forms described as species, distinct and not mere varieties. I would not have united them with the typical form, if it had not been for the examination and comparison of an immense number of intermediate specimens from different localities.

The variety *multicostata* may be distinguished from the typical form and any of the recorded varieties and so-called species by having the shape of a short cone and much more numerous and straight ribs.

## 27. ODOSTOMIA JEFFREYSI, Bucquoy, Dautzenberg, and Dollfus.

*O. jeffreysi*, Bucq., Dautz., and Dollf. Moll. mar. Roussillon, Fasc. 4, 1883, p. 170, pl. 20. f. 10; var. *flexicosta*.

'Porcupine' Exp. 1870: Atl. St. 26-34; Med. 50, Adventure Bank.

*Distribution.* Gulf of Lyons to the Archipelago; 60-600 fms.

This seems to differ from any of the numerous varieties of *O. interstincta* in its comparatively minute size, oval shape, and having

fewer, stronger, and curved ribs. But the specific name must be changed, because it was preengaged by Koch and Weichmann for a Miocene shell.

*C. Turbonilla* or *Chemnitzia*. Striated lengthwise or reticulated, and usually toothless.

D'Orbigny, in his work on the Mollusca of the Canary Isles, proposed *Chemnitzia* as a subgenus of *Melania*, and said nothing about the heterostrophe apex or any other character which could distinguish it from *Eulima*, except that it was "fortement costulée."

## 28. ODOSTOMIA INDISTINCTA, Montagu.

*Turbo indistinctus*, Mont. Test. Br. Suppl. p. 129.

*O. indistincta*, B. C. iv. p. 149; v. p. 213, pl. lxxv. f. 1.

'Porcupine' Exp. 1869: St. 18. 1870: Atl. Vigo B. (var. *brevior*), Tangier B.

*Distribution*. Bergen southwards to the Mediterranean and Adriatic, Madeira, and Canaries; 4-60 fms.

*Fossil*. Miocene: Vienna Basin (*Hörnes*). Pliocene: Coralline Crag and Italy. Post-tertiary: Norway, West of Scotland, Belfast, and Selsea; 0-50 ft.

In addition to the synonyms given in 'British Conchology' are *Chemnitzia areolata* of Rayneval, *Truncatella julia* of de Folin, and *O. (Pyrgulina) nanodea* of Monterosato.

The late General Stefanis obligingly gave me a specimen from the Gulf of Naples, which has the peculiar shape and the delicate flexuous sculpture of the species, as well as a conspicuous tooth in the middle of the pillar. Professor Stossich showed me a similar specimen from the Adriatic. It is quite impossible, even with the aid of a lively imagination, to distinguish *Turbonilla* or *Chemnitzia* from *Odostomia* by any fixed character.

## 29. ODOSTOMIA SIGMOIDEA<sup>1</sup>, Monterosato MS. (Plate XXVI. fig. 9.)

SHELL cylindrical, rather thin, semitransparent, and glossy: sculpture, numerous but not close-set longitudinal ribs, of which there are about 25 on the last whorl and twenty on the next; these are oblique at first and afterwards become flexuous; their interstices are nearly equal in breadth to the ribs, and are throughout finely and closely striated across or spirally; the base is marked by spiral striae only, as the ribs do not extend below the periphery; apex quite smooth and polished: colour white: spire gradually tapering to a blunt point: whorls 8, somewhat compressed; the last occupies nearly two fifths of the shell: suture slight and shallow, rather oblique: mouth oval, acute-angled above and rounded below; length equal to one fifth of that of the spire: outer lip flexuous: inner lip narrow, reflected on the pillar, behind which is a small and narrow chink: tooth or columellar fold none observable. L. 0.15. B. 0.05.

<sup>1</sup> From the ribs resembling the Greek letter *sigma*.

'Porcupine' Exp. 1870: Atl. St. Tangier B. Two specimens.

*Distribution.* Algiers, a fragment (*Joly, f. Monterosato*), Palermo, a fragment (*Monterosato*); 163½ fms.

This species differs from *O. indistincta* in having fewer and larger ribs with more numerous and much finer spiral striae; the whorls are not so convex, and the suture is consequently slighter or shallower. But I must admit that it is not a satisfactory and well-established species.

### 30. ODOSTOMIA FLEXUOSA<sup>1</sup>, Jeffreys. (Plate XXVI. fig. 10.)

SHELL oblong, rather thin, semitransparent, and glossy: *sculpture* sharp and flexuous longitudinal ribs, of which there are about 20 on the last whorl and 15 on the next or penultimate whorl; these commence in a nodose and abrupt manner from just below the suture, and almost disappear at the periphery, where they are crossed by a few spiral striae: *colour* white: *spire* turreted; apex truncated: *whorls* 5, compressed; the last occupies more than half the shell with the mouth placed upwards: *suture* narrow but distinct, nearly straight: *mouth* oval, inflected above and rounded below: *outer lip* angular above and gently curved in the middle: *inner lip* filmy on the upper part and reflected on the lower part of the pillar, behind which is a small and narrow chink. L. 0.1. B. 0.05.

'Porcupine' Exp. 1870: Med. St. 55. Two specimens.

### 31. ODOSTOMIA CLATHRATA, Jeffreys.

*O. clathrata*, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 345: B. C. iv. p. 148; v. p. 212, pl. lxxiv. f. 9.

'Porcupine' Exp. 1870: Med. St. Adventure Bank (fragment).

*Distribution.* Birterbuy B., Connemara (*Barlee and J. G. J.*), throughout the Mediterranean and Adriatic, Madeira (*Watson*), Canaries (*McAndrew*); 20–25 fms.

*Fossil.* Miocene: Vienna Basin (Coll. Hörnes in mus. Vind.)! Pliocene: Monte Mario and Sicily.

### 32. ODOSTOMIA SCALARIS, Philippi.

*Melania* (afterwards *Chemnitzia*) *scalaris*, Phil. Moll. Sic. i. p. 157, t. ix. f. 9.

*O. scalaris*, B. C. iv. p. 160; v. p. 213, pl. lxxv. f. 7, and var. 8.

'Porcupine' Exp. 1870: Atl. St. Vigo B.; Med. 45, Rasel Amoush. All typical specimens.

*Distribution.* Typical form: Norway (*McAndrew*), Unst, in Shetland (*J. G. J.*), western and southern coasts of England and Ireland, northern and western coasts of France, Spain and Portugal, Mediterranean and Adriatic, Madeira; 8–108 fms. Var. *rufescens*. Finmark southwards to the Hebrides and county Antrim; 10–90 fms.

*Fossil.* Pliocene: Coralline Crag and Italy. Post-tertiary: Norway (var. *rufescens*); 70–100 feet. Not *Odontostoma scalaris* of Sandberger from the Mayence Basin.

<sup>1</sup> Having flexuous ribs.

Neither is the present species the *Turritella interrupta* of Totten (as stated in 'British Conchology'), which I am now disposed, from specimens and further information, to refer to the following species.

### 33. ODOSTOMIA RUFA, Philippi.

*Melania* (afterwards *Chemnitzia*) *rufa*, Phil. Moll. Sic. i. p. 156, t. ix. f. 7.

*O. rufa*, B. C. iv. p. 162; v. p. 213, pl. lxxvi. f. 1, and var. 2.

'Porcupine' Exp. 1869: St. 13, 14, 18, North Channel. 1870: Atl. 3a, 9, 13, 24, 27, 28, (and var. *fulvocincta*). Var. *densicostata* (*Chemnitzia densicostata*, Ph. Moll. Sic. ii. p. 137, t. xxiv. f. 9), 1870: Atl. 3, Setubal B., 24, 29, 30; Med. Adventure Bank.

*Distribution*. Typ. Anglesea to Cornwall, Atlantic coasts of France and Portugal, Mediterranean and Adriatic, Madeira and Canaries, New Brunswick, Massachusetts, New England, and North Carolina; 0-365 fms.

Var. *fulvocincta*, Lofoten I. to the Dogger Bank and Ireland, Brittany (*Cailliaud*), Tuscany (*Appelius*)!; 18-60 fms. Var. *densicostata*. Gulf of Gascony, Mediterranean and Adriatic, off Culebra, St. Thomas ('Challenger' Exp.); 30-390 fms.

*Fossil*. Pliocene: Coralline Crag, Biot, and Italy; var. *fulvo-cincta*, Lombardy (coll. Brocchi)! Post-tertiary: var. *fulvo-cincta*. Norway, Selsea; 0-80 ft. Var. *densicostata*, Sicily (*Brugnone*).

Further examination and comparison of the typical form and its varieties with *Turritella interrupta* of Totten, which is common on the eastern coasts of North America, as well as my own dredging off Massachusetts, since the publication of 'British Conchology' (when I referred that species to *O. scalaris*), have satisfied me that it is the same species as *O. rufa* and not *O. scalaris*. The figure in Gould's work is incorrect and misleading. Totten's specific name is prior to that of Philippi, and therefore ought to be adopted. I believe that *Turbonilla rathbuni* of Verrill and Smith is a pretty and deep-water form of the present variable species.

The variety *densicostata* is much smaller, narrower, and more slender than the typical form, and is sometimes banded like the variety *fulvocincta*. The ribs appear to be more crowded, because the shell is narrower, and they differ in the degree of obliquity. Specimens from Station 3 of the 'Porcupine' Expedition of 1870 and from Corsica are intermediate in every respect between the typical form and the variety *densicostata*.

### 34. ODOSTOMIA STRIATULA, Linné.

*Turbo striatulus*, L. S. N. p. 1238.

*Turritella potamoides*, Cantraine, Mal. Med. pl. vi. p. 25.

'Porcupine' Exp. 1870: Med. St. 55, Benzert Road, G. Tunis, Adventure Bank.

*Distribution*. Throughout the Mediterranean and Adriatic; 0-120 fms.

*Fossil*. Pliocene: Coralline Crag, Biot, Italy, Rhodes.

*Turritella potamoides*, Cantraine, *Melania* (afterwards *Chemnitzia*) *pallida*, Philippi, *Parthenia varicosa*, Forbes, and *Chemnitzia costaria*, S. Wood.

In a specimen from the Gulf of Tunis the throat or inside of the upper lip is crenated, like *Chemnitzia costaria* of the Crag.

### 35. ODOSTOMIA MAGNIFICA, Seguenza.

*Turbonilla magnifica*, Seg., Le formazione terziarie nella Provincia di Reggio (Calabria), 1879, p. 264, t. xvi. f. 25.

'Porcupine' Exp. 1870: Atl. St. 6, 16, 25, 27-28.

*Distribution.* Vigo (*McAndrew*), Bay of Biscay ('Travailleur' Exp. 1880-1881), off C. Verd I., Azores ('Talisman' Exp.), New England (*Verrill*); 217-1062 fms.

*Fossil.* Pliocene: Reggio, Calabria (*Seguenza*)!

This fine species varies considerably in shape, as well as in the number and direction of the ribs, which are sometimes straight and sharp, and in other specimens oblique and flattened; but there is a character common and peculiar to all the specimens (European, American, and fossil) which I have examined, viz. the close striation length-wise by delicate and microscopical lines which cover the whole of the shell. These striæ are not mere marks of growth, but a distinct kind of sculpture.

*Turbonilla bushiana* of Verrill. Not *Turbonilla meneghini* of Libassi, according to the figure and a typical specimen received from Professor Seguenza; nor is it *Turbonilla speciosa* of H. Adams. But the last two species are allied to the present, as well as *Turbo plicatulus* of Brocchi.

Fragments of recent specimens from the 'Porcupine' Expedition show that this species attains much larger dimensions than those given in the descriptions of Seguenza and Verrill.

### 36. ODOSTOMIA LACTEA, Linné.

*Turbo lacteus*, L. S. N. p. 1238; Cantr. Mal. Med. pl. vi. f. 21.

*O. lactea*, B. C. iv. p. 164; v. p. 213, pl. lxxvi. f. 3.

'Porcupine' Exp. 1869: St. 9. 1870: Atl. Vigo B.; Med. Algeiras B., G. Tunis, Adventure Bank.

*Distribution.* Tromsø to the Archipelago, Adriatic, Morocco, Canary I., Madeira, and Azores; 0-50 fms. Perhaps this may be *Chemnitzia nivea* of Stimpson from 40 fms. off Grand Maran, which he described as "T. aciculata, subcylindrica, alba, nitida; anfractibus planatis, longitudinaliter plicatis, plicis rectis, interstitiis lævissimis. Long. 0.28; lat. 0.04 poll." Not Red Sea, as given by Philippi on the authority of Hemprich and Ehrenberg.

*Fossil.* Miocene: Vienna and Bordeaux Basins. Pliocene: Coral-line and Red Crag, Belgian Crag, Biot (*Battersby*), Nice (*Allan*), Italy. Post-tertiary: Belfast, Selsea, Leghorn, Taranto, Morea, and Rhodes.

*Turbo albus*, Pennant, *T. acutus*, Donovan, *T. elegantissimus*, Montagu, *Turbonilla plicatula*, Risso, *Melania campanilla*, Philippi, and several later synonyms which it is unnecessary to notice. Risso's

*Eulima elegantissima*, for which he misquoted Montagu, appears to be *E. polita*. Not *O. lactea* of d'Orbigny, nor of Dunker, nor of Angas.

This common species is consequently variable as regards the straight or oblique direction of the ribs, as well as the comparative breadth of the shell. The pillar has occasionally a tooth-like fold.

37. *ODOSTOMIA SINUOSA*<sup>1</sup>, Jeffreys. (Plate XXVII. fig. 1.)

SHELL resembling a short pyramid, rather thin, semitransparent and glossy: *sculpture*, numerous, fine, flexuous and close-set longitudinal ribs, arranged obliquely, and commencing abruptly at the top of each whorl, and not continued below the periphery; there are about 25 on the last whorl; the first or nuclear whorl is, as usual, quite smooth: *colour* white: *spire* rather short, and ending in a sharp point: *whorls* 8 (exclusive of the nucleus), convex and rapidly enlarging; the last occupies more than two fifths of the shell: *suture* narrow and oblique: *mouth* irregularly rhomboidal, equal in length to between one third and one fourth of the spire: *outer lip* inflexed at the top, gently curved in the middle, and semi-circular at the bottom: *inner lip* expanded and thickened: *tooth* or columellar fold slight but distinct. L. 0.175. B. 0.05.

'Porcupine' Exp. 1870: Med. St. Adventure Bank. A single specimen.

*Distribution*. Mediterranean (Italian Exp.), off west coast of Africa ('Talisman' Exp.); 681 fms.

Allied to *O. lactea*, but differs in its more conical and less cylindrical shape, being proportionally broader at the base, and the ribs are more decidedly flexuous and oblique. In *Chemnitzia obliquata*, of Philippi, the whorls are fewer and more tumid.

38. *ODOSTOMIA PUSILLA*, Philippi.

*Chemnitzia pusilla*, Phil. Moll. Sic. ii. p. 224. t. xxviii. f. 21.

*O. pusilla*, B. C. iv. p. 167, v. p. 215, pl. lxxvi. f. 4.

'Porcupine' Exp. 1870: Atl. St. Vigo B.; Med. 50, Adventure Bank.

*Distribution*. Birterbuy Bay, W. Galway (*Walpole*), British Channel and South of England, Atlantic coasts of France, throughout the Mediterranean and Adriatic, and Madeira (*Watson*); 10-100 fms.

*Fossil*. Pliocene: Biot, Italy. Post-tertiary: Morea and Rhodes.

On further consideration I must hesitate in considering this species, which I described and figured under the above name, as that of Philippi. The size given by him is much smaller, the ribs are said to be set obliquely, and he noticed transverse or spiral striæ, which my species does not possess. Judging from the excellent figure (plate 21, fig. 12) of "*Turbonilla gradata*, Monterosato," in the 'Mollusques du Roussillon' of Messrs. Bucquoy, Dautzenberg, and Dollfus, which represents a variety of the present species, I am inclined to adopt the latter name. It is certainly distinct from *O. lactea* and its varieties.

<sup>1</sup> Full of curves.

39. *ODOSTOMIA DELICATA*, Monterosato.

*Chemnitzia gracilis*, Phil. Moll. Sic. ii. p. 137, t. xxiv. f. 11.

*O. delicata*, Monter. J. de Conch. 1874, p. 267.

'Porcupine' Exp. 1869 : St. 18, Donegal B. 1870 : Atl. 17.

*Distribution.* Bundoran, Co. Donegal, with *Circulus striatus* (J. G. J.), Loire-Inferieure (*Cailliaud*), Gulf of Gascony (*de Folin*), Mediterranean from Spezia to Alexandria, and Adriatic; 18-120 fms.

Not *Turbo gracilis* of Brocchi, nor *Chemnitzia gracilis* of de Koninck, fossil species of *Odostomia*.

The columellar fold or tooth is sometimes observable in this species. The following is my note as to the animal.—"Body clear white, with a narrow dark streak down each side: mantle thick: head or snout (mentum) narrower than the foot and extending beyond it; extremity notched in the middle: tentacles leaf-like and folded, proportionally large: eyes small and black, sessile on the inner side of the tentacles at their base: foot long, squarish or truncated in front, with angular corners, pointed behind. Active and not very shy or timid."

40. *ODOSTOMIA ACUTICOSTATA*<sup>1</sup>, Jeffreys. (Plate XXVII. fig. 2.)

SHELL obeliscal or spit-shaped, rather thick, opaque, and glossy: sculpture, several equal-sized, narrow, linear, and oblique longitudinal ribs, about 20 on the last whorl; they are considerably narrower than their interstices, and do not extend beyond the periphery, where they are intercepted by a thread-like spiral stria; the base and apex are quite smooth: colour white: spire long, turreted, and gradually tapering: whorls 9 (including the nucleus), rather convex, the last occupying about a third of the shell; nucleus regularly spiral and intorted: suture shallow but well defined, nearly straight: mouth small, squarish: outer lip contracted above and curved below: inner lip and pillow thickened: umbilicus and tooth none. L. 0.125. B. 0.05.

'Porcupine' Exp. 1870 : Med. St. 45, Rasel Amoush. Two specimens.

*Distribution.* Cape Breton (*de Folin*), Palermo (*Monterosato*), Gulf of Gabes on the Tunisian coast (*Dautzenburg*); 20-103 fms.

The ribs are not so close-set or contiguous as in *O. lactea* and other species of the same section, and they are much narrower than the interspaces.

Not *Turbonilla acuticostata* of Speyer, a Miocene species, which is a synonym of *Auricula costellata* of Grateloup.

41. *ODOSTOMIA FULGIDULA*<sup>2</sup>, Jeffreys. (Plate XXVII. fig. 3.)

SHELL shaped like a short cylinder, strong for its minute size, nearly transparent, and of a prismatic lustre: sculpture, several straight or linear, and sharp longitudinal ribs, which are narrower than their interstices, and are apparently but not really continuous; there are 15 or 16 on the last whorl, and they do not extend below the

<sup>1</sup> Sharply ribbed.

<sup>2</sup> Somewhat bright.

periphery; base and nucleus ribless; the whole surface of the shell (except the nucleus) is covered with extremely numerous and close-set spiral striæ, which are discernible only with the aid of a microscope: *colour* glassy: *spire* rather long, and gradually tapering to a blunt point: *suture* slight: *whorls* 6, besides the nucleus, which is spirally twisted and intorted; the last or body-whorl occupies two fifths of the spire: *mouth* oval, acutangular above and curved below: *outer lip* thin: *inner lip* inconspicuous: *umbilicus* none, but the base is shallowly excavated. L. 0.075. B. 0.035.

'Porcupine' Exp. 1870: Atl. St. 13. Half a dozen living specimens.

This beautiful little shell may be distinguished by the numerous microscopic spiral striæ, as well as by its shape and prismatic lustre.

#### 42. ODOSTOMIA ATTENUATA<sup>1</sup>, Jeffreys. (Plate XXVII. fig. 4.)

SHELL club-shaped, thin, semitransparent, and very glossy: *sculpture*, long, sharp, and curved longitudinal ribs, from 18 to 20 on the last whorl, and with equally broad interstices; these ribs are not continued beyond the periphery, and in one specimen they nearly disappear on the last whorl; apex quite smooth: *colour* whitish, with a faint tinge of yellowish-brown: *spire* elongated, and gradually tapering to a blunt and apparently truncated point: *suture* well defined: *whorls* 6, exclusive of the nucleus, which is globular, spiral, and intorted; the last whorl occupies two fifths of the spire: *mouth* and *lips* as in the last species: *base* sloping. L. 0.125. B. 0.035.

'Porcupine' Exp. 1870: Atl. St. 17; Med. 55.

*Distribution.* Gulf of Marseilles ('Travailleur' Exp.), off western coast of Africa ('Talisman' Exp.); 363-1259 fms.

#### 43. ODOSTOMIA COMPRESSA<sup>2</sup>, Jeffreys. (Plate XXVII. fig. 5.)

SHELL cylindrical, compressed in the middle of each whorl, rather thick, semitransparent and glossy: *sculpture*, sharp and straight longitudinal ribs, which commence at the top of each whorl and more or less disappear at the periphery; their number is about 25 on the last whorl; they are usually of the same breadth as the interstices, but occasionally narrower; base and apex quite smooth: *colour* whitish, with a broad but obscure spiral band of reddish-brown in a young specimen: *spire* turreted, elongated and gradually tapering: *suture* narrow but distinct: *whorls* 10, flattened, contracted in the middle of each; the last occupies about two fifths of the spire; nucleus twisted: *mouth* oval, acutangular above, rounded below: *outer lip* incurved, and flexuous in the middle: *inner lip* thickened and somewhat expanded: *base* sloping. L. 0.25. B. 0.075.

'Porcupine' Exp. 1870: Atl. St. 17, 36; Med. 40, Benzert Road.

*Distribution.* Gulf of Marseilles ('Travailleur' Exp.), off the west coast of Africa, C. Verd I., and Azores ('Talisman' Exp.), off the Azores ('Challenger' and 'Talisman' Exp.); 363-1622 fms.

<sup>1</sup> Attenuated or narrowed.

<sup>2</sup> Pressed or squeezed together.

44. *ODOSTOMIA PAUCISTRIATA*<sup>1</sup>, Jeffreys. (Plate XXVII. fig. 6.)

SHELL forming an elongated cone, rather thick, semitransparent, and of a prismatic lustre: *sculpture*, straight, slight, and irregular longitudinal ribs, about 20 on the last whorl, but varying in number, extension, and size: *colour* white: *spire* produced, and somewhat abruptly tapering: *suture* rather deep, nearly straight: *whorls* 8 besides the nucleus, moderately convex but not tumid; the last occupies two fifths of the spire; nucleus twisted outwards: *mouth* pear-shaped, pointed above and rounded below: *outer lip* thin: *inner lip* thickened: *base* angulated in the young. L. 0·275. B. 0·085.

'Porcupine' Exp. 1870: Med. St. Benzert Road. Four specimens of different sizes.

*Distribution*. Bay of Biscay ('Travailleur' Exp. 1880 and 1881), Palermo and S. Vito (*Monterosato*), off west coast of Africa ('Talisman' Exp.), off Culebra, Danish W. Indies ('Challenger' Exp.); 108-681 fms.

*Fossil*. Pliocene: Messina (*Seguenza*), Altavilla (*Monterosato*)!

Although this appears to differ from *O. compressa* in being conical instead of cylindrical, as well as in the less compression of the whorls and the irregularity of the sculpture, I am not satisfied that they are distinct species. I therefore give both provisionally. Two specimens of the present species have a rather strong tooth-like fold on the inside of the pillar.

45. *ODOSTOMIA SEMICOSTATA*<sup>2</sup>, Jeffreys. (Plate XXVII. fig. 7.)

SHELL cylindrical, rather thick, semitransparent and glossy: *sculpture*, a few slight longitudinal ribs, sometimes covering the top whorls only, but in most specimens disposed irregularly over the shell; in one specimen the whole of the surface is seen under the microscope to be finely striated in a spiral or transverse direction: *colour* white: *spire* elongated and ending somewhat abruptly in the nuclear point: *whorls* 8 besides the nucleus; they are rounded but not convex, and are compressed in the middle; the last occupies about one third of the spire; nucleus bulbous and regularly spiral, like all other species of this genus: *suture* narrow: *mouth* trapezoid: *outer lip* inflected and pointed above, contracted in the middle, and curved below: *inner lip* thickened: *base* somewhat angulated, particularly in the young: *pillar* nearly straight: *tooth* or columellar fold sunken but conspicuous in a broken specimen. L. 0·15. B. 0·035.

'Porcupine' Exp. 1870: Atl. St. 26-30.

*Distribution*. C. Breton, Gulf of Gascony (*de Folin*)!

*D. Eulimella*. Cylindrical, smooth, and toothless.

46. *ODOSTOMIA SCILLÆ*, Scacchi.

*Melania scillæ*, Sc. Notizie int. alle Conch. p. 51, t. ii. f. 2.

*O. scillæ*, B. C. iv. p. 169; v. p. 213, pl. lxxvi. f. 5.

'Lightning' Exp. St. 2.

<sup>1</sup> Having few ribs.

<sup>2</sup> Half-ribbed.

'Porcupine' Exp. 1869 : 3, 6. 1870 : Atl. 6, 9, 26-29 ; Med. 50, Rasel Amoush, Adventure Bank.

*Distribution.* Finnmark to the Mediterranean, Canaries, Madeira, off C. Verd I. and west coast of Africa ('Talisman' Exp.); 12-1192 fms.

*Fossil.* Miocene : Vienna Basin (Hörnes)!, N. W. Germany (Philippi). Pliocene : Biot and throughout Italy. Post-tertiary : Christiania, Rhodes ; 0-100 ft.

Varies in the length of the spire and in the comparative breadth of the shell.

#### 47. ODOSTOMIA COMPACTILIS, Jeffreys.

*O. scillæ*, var. *compactilis*, B. C. iv. p. 169.

*Eulimella compactilis*, G. O. Sars, Moll. arct. Norv. p. 208, t. 22. f. 15.

'Porcupine' Exp. 1869 : St. 4, 18, 23. 1870 : Atl. 3. A single specimen from each station.

*Distribution.* Lofoten I. and W. Norway, Shetland and Hebrides ; 50-300 fms.

Possibly *O. (Eulimella) superflua* of Monterosato, from Palermo.

#### 48. ODOSTOMIA ACICULA, Philippi.

*Melania* (afterwards *Eulima*) *acicula*, Phil. Moll. Sic. i. p. 158, t. ix. f. 6.

*O. acicula*, B. C. iv. p. 170 ; v. p. 213, pl. lxxvi. f. 6.

'Porcupine' Exp. 1869 : St. 18, 19, 25, the Minch. 1870 : Atl. 3, 9, Vigo B., Setubal B., 26-28, 31-34 ; Med. 55, Benzert Road, Rasel Amoush, G. Tunis, Adventure Bank.

*Distribution.* Everywhere in the eastern portion of the North Atlantic from Bergen to the Bay of Biscay, as well as in the Mediterranean and Adriatic, Corea (*St. John*) ; 8-645 fms.

*Fossil.* Pliocene : Red Crag, Biot, and Italy. Post-tertiary : Christiania and Caithness.

Some specimens from different localities exhibit a more or less conspicuous tooth.

As to the specific name, Monterosato observed that long before Philippi's work, Lamarck had used it for another species (a Grignon fossil) of the present genus ; but the figure (pl. 60, f. 9) in the 8th volume of the 'Annales du Muséum,' which Deshayes in his second edition of the 'Histoire naturelle des animaux sans vertèbres,' refers to the *Auricula (acicula)* of the 6th volume of the 'Annales,' can hardly be correct, because none of the other figures in the same plate correspond with either the numbers or the brief descriptions given by Lamarck in his list of species. Indeed, Deshayes says, as to *Auricula acicula*, "Il est très-probable que cette espèce n'est point une Auricule, mais une Tornatelle allongée." The genus *Auricula* of Lamarck was a heterogeneous assemblage of species, and included *Melampus*, *Actæon* or *Tornatella*, *Odostomia*, *Pyramidella*, and *Ringicula*. The peculiar character of the *Pyramidellidæ*, viz. the sinistral nucleus, was not noticed by Lamarck or Deshayes.

49. *ODOSTOMIA VENTRICOSA*, Forbes.*Parthenia ventricosa*, Forb. Rep. Æg. Inv. (1843), p. 188.*O. acicula*, var. *ventricosa*, B. C. iv. p. 171; v. p. 213, pl. lxxvi. f. 7.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: 25. 1870: Atl. 9, 17<sup>a</sup>, 26-28<sup>a</sup>; Med. Benzert Road, Rasel Amoush, Adventure Bank.*Distribution.* Lofoten I. to the Hydra Channel and Crete, Adriatic, off C. Verd I. ('Talisman' Exp.), Madeira (*Watson*)!; 10-1192 fms.*Fossil.* Pliocene: Italy. Post-tertiary: Biot and Leghorn.

Although it is difficult, if not impossible, to distinguish this from *O. acicula*, except as a variety, I will defer to the opinion of my friend Professor G. O. Sars, and consider them separate species. This kind of distinction is not very material in a scientific point of view, where there is any valid or peculiar character. The present species has a more delicate texture, the whorls are more swollen, the suture is consequently deeper, and the shell becomes more attenuated towards the apex. Nevertheless, there are intermediate gradations, as is the case with other allied forms. Both species have several synonyms. In the Annals and Magazine of Natural History for 1848 I described the present species under the name of *Eulimella gracilis*; but Forbes did not recognize it as his *Parthenia ventricosa*. He described his shell as "subumbilicate," a character which does not belong to mine. The animal is described in the Supplement to 'British Conchology.'

*PYRAMIDELLA NITIDULA*, A. Adams. (Plate XXVII. fig. 8.)*Syrnola* (afterwards changed to *Obeliscus*) *nitidula*, A. Adams in Ann. & Mag. N. H. 1860, p. 335.'Porcupine' Exp. 1870: Atl. St. 3<sup>a</sup> (var. *exilis*), 9, 16, 17, 28-30; Med. 45, 55 (var. *exilis*), Adventure Bank.*Distribution.* Bay of Biscay ('Travailleur' Exp. 1881 and 1882), European and African coasts of the Mediterranean, off the Cape de Verd I. ('Talisman' Exp.), St. Thomas, D. W. I. and Fayal ('Challenger' Exp.), Japan and Corea (*A. Adams* and *St. John*); 40-487½ fms.*Fossil.* Pliocene: Reggio (*Sequenza*).

*Synonyms.* *Pyramidella minuscula* and *P. mediterranea* of Monterosato, *Obeliscus sufarcinatus* and *O. tinctus* of Watson. Perhaps the variety, which I have named *exilis*, may be a distinct species. It is much smaller, narrower, and spindle-shaped; but the specimens are too young or immature and imperfect for complete description.

The shell being deeply umbilicated may constitute the type of a section which I would name *Tiberia*, in honour of that excellent naturalist Dr. Nicola Tiberi of Portici near Naples.

I have carefully compared my 'Porcupine' and Mediterranean specimens with those from Japan and Corea, which I received from

the late Mr. Arthur Adams and my friend Captain St. John, and I cannot detect the slightest difference between any of them in shape, coloured band, umbilicus, or dentition of the pillar. *P. leviuscula* of the Crag has no umbilical perforation; otherwise the recent and fossil species are exactly similar. Some of the recent as well as Crag specimens, and those of *P. plicosa* (if this be not the same as the Crag species) have the throat or inside of the outer lip thickened and crenated, as in *Odostomia conoidea* and other species of that genus. It must be borne in mind that species of different genera are common to the North Atlantic and North Pacific Oceans, as well as to the Crag, e. g. *Pecchiolia acuticostata*.

**MATHILDA QUADRICARINATA, Brocchi.**

*Turbo quadricarinatus*, Broc. Conch. Foss. Subap. ii. p. 375, t. vii. f. 6.

*M. quadricarinata*, Kobelt in Jahrb. d. d. Mal. Ges. 1874, p. 226, t. ii. f. 2, 2<sup>a</sup>.

'Porcupine' Exp. 1870: Atl. St. off C. Sagres, 26-30, 36; Med. 50, 50<sup>a</sup>, Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution*. Bay of Biscay ('Travailleur' Exp. 1881), Mediterranean and Adriatic, Madeira (*Watson*)!; 8-227 fms.

*Fossil*. Miocene: Maine et Loire (*Baudin*), Malaga (*Duncan*). Pliocene: Antwerp Crag (*Omalius*), Biot, and Italy.

A Sicilian specimen, kindly sent me by the late Professor Aradus, measures nearly an inch and a quarter in length and  $\frac{1}{10}$  of an inch in breadth. The sculpture of this species varies considerably, and this has, of course, given rise to several synonyms, including *Eglisia macandrea* of A. Adams, and two or three so-called species of *Brugnone*.

The correct position of the genus *Mathilda*, O. Semper, 1865, is rather questionable. It certainly approaches *Turritella* in some respects; and my only reason for placing it provisionally in the *Pyramidellidae* is the heterostrophe or sinistrorsally spiral apex. I have thought it desirable to give (Plate XXVII. fig. 9) a magnified figure of this character.

I subjoin a description of the animal taken from a living specimen during the 'Porcupine' Expedition of 1870:—*Body* cream-colour: *tentacles* thread-shaped, smooth, very long and slender, bluntly pointed, and diverging: *eyes* proportionally large, seated on small tubercles or bulbs on the outer side of the tentacles about one fourth from their base: *foot* large, in front deeply bilobed with remarkably long auricles, behind angulated on the upper part and rounded at the tail or extremity; the foot-lobes are jagged inside, and double-edged in that part with a row of close-set short and exquisitely fine cilia which are in continual motion: *operculum* chitinous, rather solid, multispiral with umbilicated whorls, like that of *Turritella terebra*. Animal active and bold.





J. Smit lith.

Hodgart imp.

PHALANGISTA ARCHERI.





2

J. Smith del.

Hanhart imp.

PHALANGISTA HERBERTENSIS. 1♂, 2♀.

## Family XVIII. EULIMIDÆ.

Genus GEGANIA<sup>1</sup>, Jeffreys.

SHELL conical, reticulated, not umbilicated; nucleus globular and intorted, not spiral, nor sinistral. Differs from *Mathilda* in having a short spire and an intorted but not a heterostrophe nucleus.

Perhaps this genus, which in a great measure is founded on negative characters, may be the type of a separate family. The shell certainly is not smooth and polished like *Eulima*.

GEGANIA PINGUIS<sup>2</sup>, Jeffreys. (Plate XXVII. fig. 10.)

SHELL forming a short cone, rather thin, opaque and of a dull hue: *sculpture*, several spiral ridges, which are crossed by much more numerous and flexuous longitudinal striæ, so as to cause a partial decussation; the spiral ridges vary considerably in number and strength, and sometimes they are alternately large and small, but they become at the base crowded and fine revolving striæ; apex smooth and glossy: *colour* whitish: *spire* short, bluntly pointed: *whorls* 5, swollen; the last occupies more than two thirds of the shell; nucleus bulbous, introverted: *suture* deep: *mouth* squarish, acutangular above and nearly rectangular below: *outer lip* semi-circular except for the upper corner of the mouth: *inner lip* reflected, broader on the lower part of the pillar, which is very gently curved: *base* expanded, slightly concave or depressed but not umbilicated nor angulated. L. 0.3. B. 0.16.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17 a.

## 1. EULIMA SUBULATA, DODOVAN.

*Turbo subulatus*, Don. Br. Sh. pl. clxxii.

*E. subulata*, B. C. iv. p. 208; v. p. 215, pl. lxxvii. f. 7.

'Porcupine' Exp. 1869: St. 2, 9, 18 (and var. *nana*). 1870: Atl. Vigo B., 29, 30 (var. *pallidula*); Med. 50, 55, Benzert Road, G. Tunis, Adventure Bank. Variety *pallidula*; bands of a paler colour, and more or less interrupted.

*Distribution*. Dublin Bay and other parts of Ireland, Anglesea, and southern coasts of England, Atlantic coasts of France and Lusitania, throughout the Mediterranean and Adriatic, Canaries, Madeira, and Azores; 2-227½ fms. I suspect that the following localities may have been misapplied to this species instead of to *E. bilineata*:—Scarborough (*Bean*); Orkneys, 12 fms. (*Forbes*); Shetland, 5-90 fms. (*Forbes*).

*Fossil*. Miocene: Vienna and Bordeaux Basins, N.W. Germany, Transylvania, Podolia, and Volhynia. Pliocene: Coralline and Antwerp Crags, France and Italy.

Of the numerous synonyms, which it is unnecessary to recapitulate, *glaber* of Da Costa is prior to *subulata* and every other; but the present name has been sanctioned by use. The dwarf variety (*nana*) shows that size is not the only character which distinguishes

<sup>1</sup> The name of one of the Vestal Virgins.

<sup>2</sup> Plump.

this species from *E. bilineata*; this variety has the usual slender shape and coloured markings of *E. subulata*, and is Mediterranean as well as Atlantic.

## 2. EULIMA BILINEATA, Alder.

*E. lineata* (as probably of Sowerby, but proposed to be changed to *bilineata*), Ald. Cat. Moll. North. & Durh. in Trans. Tyn. Nat. Field Club, p. 47.

*E. bilineata*, B. C. iv. p. 210; v. p. 215, pl. lxxvii. f. 8.

'Lightning' Exp.: St. 2, 5.

'Porcupine' Exp. 1869: 15, 18, 23a, N. Channel. 1870: Atl. 3a, 26; Med. Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution.* Hammerfest, Lofoten I., and Bodö to the Adriatic and Alexandria, off west coast of Africa ('Talisman' Exp.); 0-681 fms.

*Fossil.* Pliocene: Sicily. Post-tertiary: Norway and Belfast; 100 ft.

This pretty little shell is closely allied to *E. subulata*, and may be regarded as a "critical" species. Specimens from Skye and Belfast are much larger than the dwarf variety of *E. subulata*. The characteristic differences are pointed out in 'British Conchology.' Some specimens of the present species are slightly curved.

## 3. EULIMA JEFFREYSIANA, Brusina. (Plate XXVIII. fig. 1.)

*Leiostraca jeffreysiana*, Brus. in J. de Conch. xvii. (1869), p. 245.

'Porcupine' Exp. 1870: Med. St. 50, Benzert Road, Adventure Bank. The specimen from Benzert Road is larger than others, and measures nearly a line and a half in length; the usual length is a line, or one tenth of an inch.

*Distribution.* Mediterranean and Adriatic, Canaries (*McAndrew*)!, Madeira (*Watson*)!; 30-120 fms.

## 4. EULIMA POLITA, Linné.

*Turbo politus*, L. S. N. p. 1241.

*E. polita*, B. C. iv. p. 201; v. p. 214, pl. lxxvii. f. 3.

'Porcupine' Exp. 1870: Med. St. 50, G. Tunis.

*Distribution.* Finmark to the Ægean; 2-145 fms.

*Fossil.* Miocene, Pliocene, and Post-tertiary: Norway southwards through Europe to Rhodes; 0-80 ft.

## 5. EULIMA INTERMEDIA, Cantraine.

*E. intermedia*, Cantr. Diagn. Moll. Bull. Ac. Brux. 1835, p. 14; B. C. iv. p. 203; v. p. 214, pl. lxxvii. f. 4.

'Porcupine' Exp. 1870: Atl. St. 27, 28, 28a; Med. 50.

*Distribution.* Hammerfest to the Adriatic and eastern part of the Mediterranean, Madeira and the Canaries (*McAndrew*)!, C. de Verd I. (*Rochebrune*), and New England (*Verrill*); 11-645 fms.

*Fossil.* Miocene: Vienna Basin!, N.W. Germany. Pliocene: Coralline and Red Crag, Biot, and Italy. Post-tertiary: Norway.

*E. nitida* of Philippi, but apparently not *Melania nitida* of Lamarck, from the Paris Basin.

Extremely variable in size, length of the spire, comparative slenderness, and breadth of the last whorl, as well as in a slight degree of curvature. Many species could easily be made out of it. In *E. polita* (especially the young) the periphery is angulated, but never in the present species.

Cantraine's description is too short to be satisfactory, viz.:—"Testa parva, subulata, recta, vitrea, levi. Alt. 5 lin. diam.  $1\frac{1}{4}$ ."

#### 6. EULIMA DISTORTA, Defrance.

*Melania distorta* (Defrance), Deshayes, Descr. d. Coq. foss. des environs de Paris (1824), t. ii. p. 111, pl. xiii. f. 24, 25.

*E. distorta*, B. C. iv. p. 205; v. p. 214, pl. lxxvii. f. 5.

'Porcupine' Exp. 1869: St. 9, 18 (and var. *gracilis*), 25 (and var. *gracilis*), N. Channel. 1870: Atl. 13, Vigo B., 29-34; Med. G. Tunis, Adventure Bank.

*Distribution.* Lofoten I. to the Adriatic and Archipelago, Madeira (Watson), Canaries (*d'Orbigny* and *McAndrew*). Off Sahara and west coast of Africa ('Talisman' Exp.), Azores (*Drouet*), New England (*Verrill*), St. Vincent's, West Indies (*Guilding*), Mazatlan (*P. Carpenter*), N. Japan (*St. John*)!; 0-1261 fms.

*Fossil.* Pliocene: Red Crag (*A. Bell*)!, Italy. Post-tertiary: Norway, Ayrshire, and Rhodes.

I regard as synonyms of this abundant and widely spread species, *Rissoa sinuosa*, Scacchi; *Turbo curvatus*, Chierighini (MS. only); *Balcis arcuata*, Leach (1852); and *E. philippii*, Weinkauff (1867).

Judging from the description and figure of the Eocene species in the above-cited work of Deshayes, I should have been inclined to consider it distinct from the recent species; but having lately received, through the kindness of Dr. Fischer, typical specimens of the former, I have carefully compared them with many hundred specimens of the latter, and I feel myself conscientiously bound to unite them. Some specimens of both forms have the last whorl larger in proportion to the next, or else have the outer lip more or less flexuous; the degree of curvature (which is occasionally double or flexuous) differs considerably, and the periphery is now and then somewhat angulated or keeled.

The variety *gracilis* is usually straight instead of being distorted or curved; but after a long and close examination, I have failed in discovering a single character which would justify its separation from the typical form as a distinct species. Both are equally common and generally distributed with intermediate forms.

Professor G. O. Sars found this species living in a quasi-parasitic or "commensal" state inside *Holothuria intestinalis*.

#### 7. EULIMA GLABRA<sup>1</sup>, Jeffreys. (Plate XXVIII. fig. 2.)

SHELL awl-shaped, rather strong, semitransparent, and of a polished lustre: sculpture none: colour whitish, with a faint tinge

<sup>1</sup> Smooth.

of brownish-yellow: *spire* shortish, ending in a blunt and bulbous point: *whorls* 8, somewhat convex; the first is inflected, and the last occupies about half the shell: *suture* nearly straight, well defined: *mouth* oval, proportionally large, acutangular above and rounded below; its length equals one third of the *spire*: *outer lip* flexuous: *inner lip* reflected on the pillar at its base, but not observable on its upper part. L. 0.15. B. 0.06.

'Porcupine' Exp. 1870: Atl. St. 9, 17. A single specimen from each station.

This is less slender than *E. distorta* or any of its varieties; the *spire* is shorter and quite straight, the apex is blunt and bulbous instead of finely pointed, and the *mouth* is proportionately larger.

*Distribution.* Off the coast of West Africa ('Talisman' Exp.); 1192 fms.

8. *EULIMA STALIOI*, Brusina. (Plate XXVIII. fig. 3.)

*E. stalioi*, Brus., J. de Conch. xvii. (1869), p. 242.

'Porcupine' Exp. 1870: Atl. St. 29, 30.

*Distribution.* Dalmatia (*Stalio* and *Brusina*), Algiers (coll. *Weinkauff*), off Morocco ('Talisman' Exp.)<sup>1</sup>, Madeira (*Watson*)!; 20-1192 fms.

Intermediate between *E. glabella* of Searles Wood from the Coralline Crag, and *E. brevis* of Requien from Corsica and the Adriatic. The present species may ultimately prove to be a variety of *E. brevis*. Professor Brusina having obligingly favoured me with a specimen of his *E. petitiana*, I believe it is a variety of *E. stalioi*; but I offer this opinion with great respect for his intimate knowledge of the Adriatic Mollusca.

9. *EULIMA SOLIDA*<sup>1</sup>, Jeffreys. (Plate XXVIII. fig. 4.)

SHELL nearly cylindrical, slender, thick, transparent, and very glossy: *sculpture* none perceptible with a hand-lens or ordinary magnifying power; but under a compound microscope the whole surface of the shell appears to be covered with extremely fine and close-set longitudinal striæ or lines; the periphery is more or less distinctly keeled: *colour* glassy white: *spire* elongated, sometimes curved or distorted, and ending in a bulbous nucleus: *whorls* 8, compact and flattened; the first is inflected, and the last occupies rather more than two fifths of the shell: *suture* nearly straight, well defined, but narrow; it occasionally shows a rather broad line on the lower side by reason of the overlapping of each whorl: *mouth* oval, proportionally small, acutangular above and somewhat expanded below; its length is not a third of that of the *spire*: *outer lip* flexuous, in some specimens thickened: *inner lip* glazed and reflected on the pillar. L. 0.2. B. 0.05.

'Porcupine' Exp. 1869: St. 23 a. 1870: Atl. 9, 17, 19, 27, 28.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1880 and 1881), off Morocco, west coast of Africa, and the Azores ('Talisman' Exp.); 645-1622 fms.

<sup>1</sup> Compact.

*Fossil.* Pliocene: Messina (*Sequenza*).

Although this shell is thick and strong for its size, it is so transparent that the eyes of the animal are clearly seen through a living specimen. In this specimen the two uppermost whorls are quite empty, and the end of the liver appears in the succeeding whorl; it probably arose from shrinking of the animal before death.

10. *EULIMA FUSCO-APICATA*<sup>1</sup>, Jeffreys. (Plate XXVIII. fig. 5.)

*SHELL* spike-shaped, slender, thin, transparent, and very glossy: *sculpture*, indistinct but exceedingly fine longitudinal lines, which are detected only by the microscope; the periphery is slightly keeled in some specimens: *colour* that of clear glass, except the 3 or 4 topmost whorls, which are chestnut-brown: *spire* long and finely tapering to a point: *whorls* 9-11, rather convex; the last occupies about half the shell: *suture* shallow, and somewhat oblique: *mouth* longish-oval, considerably expanding, acutangular above and obtusangular below; its length is nearly one third of that of the spire: *outer lip* remarkably flexuous and thin: *inner lip* adhering to the upper part of the pillar, and reflected a little on its lower part. L. 0.2. B. 0.075.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17 a. A fragment of this species indicates a larger size than that which is given in the description. The dark colour of the apical whorls is very peculiar and characteristic.

*Distribution.* Bay of Biscay ('Travailleur' Exp.). Off the west coast of Africa and Cape de Verd Isles; 681-1192 fms.

11. *EULIMA PIRIFORMIS*, Brugnone. (Plate XXVIII. fig. 6.)

*E. piriformis*, Brugn. Misc. Mal. 1873, p. 7. f. 5.

'Porcupine' Exp. 1870: Atl. St. 3 a, 6 (var. *bizonata*), 16, 17, 17 a. Med. Adventure Bank. Some of the specimens are more or less curved or twisted, like *E. distorta*. The variety *bizonata*, of which a single specimen occurred, has two narrow bands of reddish-brown (one below the suture, and the other encircling the periphery) on the last whorl, and two in corresponding positions on each of the other whorls. In some of the other specimens the apical whorls are coloured as in *E. fusco-apicata*; but the shape of the shell and the proportionate size of the last whorl are different. Possibly, however, both of these species may be one and the same.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1880 and 1881), Sicily (*Brugnone* and *Monterosato*), off west coast of Africa ('Talisman' Exp.), Culebra I. ('Challenger' Exp.); 11-1512 fms.

*Fossil.* Pliocene: Ficarazzi (*Brugnone*).

The figure given by the lamented author represented a fossil and not a good or characteristic specimen. I have therefore considered it advisable to figure a recent specimen.

The Rev. R. Boog Watson has described this species from the 'Challenger' Expedition as *E. chaunax*, and perhaps also as *E. hians*.

It may be distinguished from any of its congeners by the swollen

<sup>1</sup> Tipped with chestnut-brown.

shape of the last whorl, the remarkably flexuous character of the outer lip, and the pinched apex, which resembles that of *Stilifer*. The apex is more blunt than in *E. fusco-apicata*.

12. *EULIMA ABBREVIATA*<sup>1</sup>, Jeffreys. (Plate XXVIII. fig. 7.)

SHELL conical, thin, semitransparent, and glossy: *sculpture*, microscopic, close-set, regular and very fine longitudinal striæ; periphery rounded and not keeled or angulated: *colour* ivory-white, except the three apical whorls, which are light brown: *spire* short, abruptly graduating to a rather blunt point: *whorls* 7, convex; the last occupies three fifths of the shell: *suture* distinct, nearly straight: *mouth* oval, curved below: *outer lip* flexuous, as in other species of this genus: *inner lip* thick, and spread over the lower part of the pillar. L. 0.15. B. 0.075.

'Porcupine' Exp. 1870: Atl. St. 17 a. Two specimens.

13. *EULIMA SUBUMBILICATA*<sup>2</sup>, Jeffreys. (Plate XXVIII. fig. 8.)

SHELL forming a short cone, rather solid for its minute size, nearly opaque, and glossy: *sculpture* none; periphery obtusely angular: *colour* creamy white: *spire* extremely short and terminating in a blunt and bulbous point: *whorls* 5, compressed and rounded; the last occupies nearly two thirds of the shell: *suture* slight, straight: *mouth* roundish-oval, projecting beyond the line of the spire, contracted at the upper corner and rounded below: *outer lip* semicircular: *inner lip* filmy at the top and narrowly reflected on the bottom of the pillar: *umbilicus* shallow and exhibiting a small perforation behind the pillar. L. 0.05. B. 0.025.

'Porcupine' Exp. 1870: Atl. St. 27. A single specimen, but characteristic from not merely its minute size, but from its excessively short and compact spire, the shape of its mouth, and especially the umbilical perforation.

14. *EULIMA MINUTA*<sup>3</sup>, Jeffreys. (Plate XXVIII. fig. 9.)

SHELL club-shaped, thin, semitransparent, and glossy: *sculpture* none except microscopic and close-set longitudinal striæ or scratches; periphery rounded: *colour* whitish, with a slight tint of yellow: *spire* rather long; apex blunt: *whorls* 5-6, compressed; the last takes up about half the shell: *suture* slight and oblique: *mouth* oval, contracted and pointed above, curved below: *outer lip* somewhat thickened: *inner lip* also thickened, and somewhat expanding at the base, which slopes gradually. L. 0.075. B. 0.025.

'Porcupine' Exp. 1870: Atl. St. 26-29. Six specimens.

*Distribution*. Strait of Messina (*Granata-Grillo*), off Marocco ('Talisman' Exp.), 18-1192 fms.

15. *EULIMA OBTUSA*<sup>4</sup>, Jeffreys. (Plate XXVIII. fig. 10.)

SHELL somewhat cylindrical, slender, rather thick, semitransparent,

<sup>1</sup> Shortened.

<sup>2</sup> Somewhat umbilicated.

<sup>3</sup> Minute.

<sup>4</sup> Blunted.

and lustrous: *sculpture* none: *colour* whitish: *spire* long and gradually tapering to a blunt point; *whorls* 7, rounded; the last is equal in length and bulk to half the shell: *suture* very slight and scarcely separating or defining the whorls, nearly straight: *mouth* oblong-oval, rather narrow, sharply pointed above and curved below: *outer lip* thin and flexuous, not projecting or prominent: *inner lip* filmy on the upper part and adding to the pillar, thickened and reflected on the lower part of the pillar, which is gently sloping. L. 0.15. B. 0.05.

'Porcupine' Exp. 1870: Atl. St. 17a; Med. 55.

*Distribution.* Bay of Biscay ('Travailleur' Exp. 1881), off Malta (Spratt), off Sahara, C. de Verd Is., and Azores ('Talisman' Exp.); 310-2199 fms.

Has somewhat the size and appearance of *E. glabra*, but is more cylindrical, and differs particularly in the apex, which is blunt in the present species, thus connecting it with *E. stenostoma*. It is not the *E. obtusa* of De Folin ('Les Fonds de la Mer,' p. 211, pl. xxxviii. f. 11), which is apparently *E. stalioi*.

#### 16. EULIMA STENOSTOMA, Jeffreys.

*E. stenostoma*, Jeffr. in Ann. & Mag. N. H. 3rd ser. ii. p. 128, pl. v. f. 7; B. C. iv. p. 207; v. p. 215, pl. lxxvii. f. 6.

'Porcupine' Exp. 1869: St. 3, 6, 61, 68, 69.

*Distribution.* Finmark and Lofoten Is., W. & S. Norway, Shetland, N. W. of Peterhead (Metzger), Bay of Biscay ('Travailleur' Exp., 1880 and 1881), between Iceland and Greenland ('Valorous' Exp.), G. St. Lawrence (*Whiteaves*); 40-1062 fms. Palermo (*Monterosato*)?

*Fossil.* Pliocene: Coralline Crag (*S. Wood*)?

Several names of other species both of the present genus and of *Odostomia* have been proposed by the Marquis de Monterosato in his catalogues; but as they were not sufficiently, if at all, described, nor any of them figured, I cannot identify them, and I fear the names must be treated as manuscript.

#### SUMMARY OF THE FOREGOING LIST.

Families.	Genera.	Number of Species.
XVI. ACLIDÆ .....	CIONISCUS .....	2
	ACLIS .....	4
	PHERUSA .....	1
XVII. PYRAMIDELLIDÆ ....	ODOSTOMIA .....	49
	PYRAMIDELLA ....	1
	MATHILDA .....	1
XVIII. EULIMIDÆ .....	EGEGANIA .....	1
	EULIMA .....	16
		—
		Total 73

## EXPLANATION OF THE PLATES.

## PLATE XXVI.

- |   |  |
|---|--|
| Fig. 1. <i>Cioniscus gracilis</i> , p. 341. | Fig. 6. <i>Odostomia praelonga</i> , p. 350. |
| 2. — <i>striatus</i> , p. 342.              | 7. — <i>crassa</i> , p. 350.                 |
| 3. <i>Odostomia suboblonga</i> , p. 345.    | 8. — <i>unifasciata</i> , p. 351.            |
| 4. — <i>tenuis</i> , p. 347.                | 9. — <i>sigmoidea</i> , p. 354.              |
| 5. — <i>nitens</i> , p. 349.                | 10. — <i>flexuosa</i> , p. 355.              |

## PLATE XXVII.

- |  |  |
|--|--|
| Fig. 1. <i>Odostomia sinuosa</i> , p. 358. | Fig. 7. <i>Odostomia semicostata</i> , p. 361. |
| 2. — <i>acuticostata</i> , p. 359.         | 8. <i>Pyramidella nitidula</i> , p. 363.       |
| 3. — <i>fulgidula</i> , p. 359.            | 9. <i>Mathilda quadricarinata</i> (apex),      |
| 4. — <i>attenuata</i> , p. 360.            | p. 364.  |
| 5. — <i>compressa</i> , p. 360.            | 10. <i>Gegania pinguis</i> , p. 365.           |
| 6. — <i>paucistriata</i> , p. 361.         |  |

## PLATE XXVIII.

- |  |  |
|--|--|
| Fig. 1. <i>Eulima jeffreysiana</i> , p. 366. | Fig. 6. <i>Eulima piriformis</i> , p. 369. |
| 2. — <i>glabra</i> , p. 367.                 | 7. — <i>abbreviata</i> , p. 370.           |
| 3. — <i>staltioi</i> , p. 368.               | 8. — <i>subumbilicata</i> , p. 370.        |
| 4. — <i>solida</i> , p. 368.                 | 9. — <i>minuta</i> , p. 370.               |
| 5. — <i>fusco-apicata</i> , p. 369.          | 10. — <i>obtusa</i> , p. 370.              |

3. Studies in the Holothuroidea.—IV. On the Structural Characters of the Cotton-Spinner (*Holothuria nigra*), and especially of its Cuvierian Organs. By F. JEFFREY BELL, M.A., F.Z.S., Professor of Comparative Anatomy in King's College.

[Received May 15, 1884.]

Scattered through zoological literature there are here and there references to a Holothurian, of which Selenka appears to have had no knowledge, and which Semper places among the "gänzlich zweifelhaften Arten," but which, unless patriotism is a fault in a man of science, ought to be of interest to British naturalists in so far and inasmuch as it is not only the only known British representative of the restricted genus *Holothuria*, but it is, so far as we know at present, the only member of the family of Aspidochirotae, or Holothurians with shield-shaped tentacles and no retractors for the pharynx, that is found in our seas. Discovered shortly after the publication of Forbes's 'British Starfishes'—which, like every other work from that accomplished pen, had a remarkable influence on his contemporaries—it was first mentioned and described to a scientific audience by Mr. C. W. Peach in 1844, who appears (see Report, 1844, p. 65) to have satisfied the members of the British Association that, in introducing to them the "nigger or cotton-spinner," he was speaking of a Holothurian new to the British fauna. A communication on this animal was read by Mr. Peach to the Royal Polytechnic Institution of Cornwall, and is to be found, with an illustrative plate, on pp. 171–174 of the 'Annals and Magazine

of Natural History,' vol. xv. (1845). In a note on Irish Echinodermata, read to the Dublin Natural-History Society, Prof. Kinahan mentions by name "*Cucumaria niger*, Couch,"<sup>1</sup> as having been taken on the west coast of Ireland (Natural History Rev. vol. vi. p. 369); in the succeeding year (*cf. op. cit.* vol. vii. p. 394) Mr. Foot has a brief note on the habits of what he calls "*H. niger*."

Finally, Prof. Moseley has under his care a specimen in the University Museum at Oxford, which bears the name of *Holothuria nigra*, and is said to have come from the Scilly Islands.

The collection of the British Museum contains five specimens which appear to me to be referable to the species figured by Peach but never yet so described as to be, with certainty, recognized by the systematic zoologist.

The specific characters by which it may be distinguished appear to be:—Suckers almost entirely confined to the trivial surface; tentacles twenty; body elongated; integument very soft. Colour (in spirit) more or less completely black; in life the lower surface and "the thorn-like appendage on the back" are stated to be of a light green colour. Body-wall rather thick. Calcareous spicules rare; the only forms observed were perforated with four large holes, somewhat as in *Thyone fusus* (*cf.* Düben and Koren, Vetensk. Akad. Handlingar, 1844, pl. v. fig. 42). The œsophageal annularia of moderate size; radials and interradials subequal, longest along their middle line, which forms a well-marked, rather broad keel. Polian vesicle large. The Cuvierian organs packed into a large compact mass.

Measurements:—

Length . . . . .	120	110	105
Greatest breadth . .	37	4	40

The following observations may be made on the just enunciated specific characters. Though the creature has been called "Nigger" by the fisherman, and *nigra*, by the naturalist, it does, as Peach tells us, vary in colour, being "all shades, from sienna to rose-colour and delicate pink." The suckers do not, in spirit-specimens, appear to be arranged in definite rows. They are rather thickly scattered over the whole of the trivial surface; at any rate, Peach is in error in considering that this creature is remarkable for the possession of *four* rows of suckers. From Peach's illustration it would appear that the dorsal papillæ, and especially those at the sides of the body, are much more prominent in living than in preserved specimens.

In the description of the pharyngeal ossicles I have adopted the nomenclature proposed by Prof. Moseley, in his description of a remarkable Holothurian pharynx<sup>2</sup>; here annularia only, and no pharyngealia, are developed. The scarcity of calcareous spicules was to be expected as soon as one knew that "on exposure to air they lose their tenacity and crumble to pieces;" but, on the other hand,

<sup>1</sup> The addition of the name of Couch must be an error; I find no reference to the species in the 'Cornish Fauna.'

<sup>2</sup> Q. J. M. S. xxiv. (1884) p. 255.

I must again draw attention to the danger to spicules of maceration in weak spirit<sup>1</sup>, and express a hope that this communication will lead to the acquisition of some fresh specimens.

If, however, the "Nigger" has but little protection from calcareous plates, he has, as a "Cotton-spinner," a means of offence which causes him (to again quote Peach) to be "held in great detestation, from its throwing out what they (the fishermen) call cotton. . . . It is extremely irritable, and on being touched or disturbed throws out a bunch of white tapered threads about an inch in length and one eighth in thickness; these soon become attenuated, and are drawn into very long threads of great tenacity. . . . I have seen a crab so completely entangled in it as not to be able to move, and a fish only able to get away after a long struggle." This "cotton" is secreted by the Cuvierian organs, which are arranged in a mode as yet undescribed in any Holothurian.

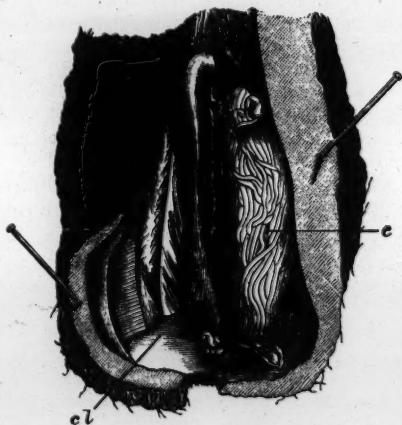


Figure of lower portion of the body of *Holothuria nigra*, opened along the dorsal middle line; the Cuvierian organs (*c*) are seen *in situ*, as is the coil of tubes in the cloaca (*cl*). A bristle has been passed into the rectal opening of the intestine, which has been pushed a little to one side.

When the body is laid open by an incision through the dorsal middle line, the whole centre of the lower part of the cœlom is seen to be occupied by a compact mass, more or less pyriform in shape, quite solid and almost hard to the touch; underlying this is the rectal portion of the intestine, while anteriorly it is hollowed out into a shallow cup, which supports a coil of the intestine (fig. 1). In a specimen 110 mm. long, the mass in question has its greatest length 39 mm.; 9 mm. forming the wall of the cup on the upper surface, where it was a little longer than elsewhere; at its thickest

<sup>1</sup> Journal Roy. Micr. Soc. 1882, p. 481.

the mass measured 15 mm., while the body itself was only 40 mm. at its widest. Traced backwards this mass is found to arise from the cloaca; separated from the investment of connective tissue (which may be in parts pigmented), its free or proximal end is seen to be easily separable into long coiled blind tubes, of which indeed the whole mass is made up. In relation, therefore, and in general structure the tubes are what Johannes Müller called Cuvierian organs<sup>1</sup>. They will be found to offer us some interesting characters, both from the morphological and physiological point of view.

In the monograph just cited, the founder of the morphology of the Echinodermata described three types of Cuvierian organs—the caecal, the racemose, and one to which he gives no distinguishing name, and which may perhaps be distinguished as verticillate. It is to the first group that the organs of *H. nigra* belong; but they differ, so far as I can learn, from any yet described, by the fact that they are closely united together into a firm bundle.

This firm union of the tubes into a single mass makes it difficult for us to imagine how single tubes can be emitted. In the woodcut, however, now given, which has been taken from a specimen in which the organ and its parts occupy their original or natural position, it will be seen that a few coiled tubes are lying in the cloaca (fig. 1, *cl*). Is it not then probable that, on excitement, a suitable contraction separates off this portion of the organ from the rest, and that another expels it to the exterior?

It is not to be thought that so small a portion of the tubes would not be of some size in the water, for 2.5 mm. of one of these tubes may, even after nearly twenty years' preservation in spirit, be stretched out to a length of more than 30 mm.; and this attenuated thread swells up so much in water that, while measuring one division of the micrometer when dry, it occupies seven divisions after treatment with distilled water for ten minutes. We can thus understand that an animal at whom these threads are thrown should, as it attempts to escape, lengthen the threads which, at the same time, coming into contact with the water, would be swollen out transversely as they were extended longitudinally.

The observations made during recent years on these Cuvierian organs seem to justify a more definite statement as to their function than the supposition of Jaeger that they are renal organs, and to lead to an acceptance of the well-grounded statement of Semper that they are not glandular tubes at all, but protective or offensive organs<sup>2</sup>. In this connexion Semper cites Peach's note on the "Cotton-spinner;" and the observations just recorded on the power of increase of length and the influence of water show that he has cited it with justice. The view of Semper, which is shared by Greef, has been recently accepted by M. Jourdan, who, like him, has had the good fortune of being able to work on living and fresh specimens<sup>3</sup>;

<sup>1</sup> "Ueber den Bau der Echinodermen," Abh. Ak. Berl. 1853.

<sup>2</sup> 'Holothurien,' p. 140.

<sup>3</sup> Annales du Musée d'hist. nat. de Marseille, i. Part 2, no. 6. See also O. Hamann, Zeitschr. f. wiss. Zool. vol. xxxix.

I, I fear, can speak most authoritatively of the accuracy of Semper's statement: "An Spirituspräparaten ist so gut wie Nichts von ihrem feineren Bau zu erkennen"<sup>1</sup>.

Finally, as to the systematic value of the Cuvierian organs we must, I think, agree with Semper that they are "viel weniger charakteristisch in ihren Formen für die einzelnen Gattungen, als es nach Müller's Arbeiten scheinen könnte." At any rate, in no other organ does *H. nigra* display any character or combination of characters which would lead us to separate it off from the rest of the true *Holothuræ*.

The five specimens in the British Museum were obtained off the coast of Cornwall; two are said to have been "taken about some crab-pots, at a depth of 20 fms. Polperro."

#### 4. On Races and Hybrids among the Salmonidæ.—Part II. By FRANCIS DAY, F.Z.S.

[Received May 19, 1884.]

On January 15th of this year (see P. Z. S. 1884, p. 17) I gave an account of the continuation of some experiments made by Sir J. Gibson-Maitland, F.Z.S., on the breeding and hybridization of Salmonidæ at Howietoun, and the inception of a few new ones. I propose in this paper to briefly remark upon their continuation, and how matters stood on March 13th, 1884.

First, as to the hybrids between Salmon and Lochleven Trout. The oldest batch of these hybrids are the descendants from 20,000 eggs of the Trout milted from *Salmo salar* December 24, 1881, and which up to March 13, 1884, had been kept in a planked pond, 20 feet long by 5 feet wide. On this date those which remained (numbering 212), all of which appeared to be in perfect health, were removed to the octagon pond at Craigend. Among them, six were over 10 inches in length, but the majority were smaller, and some not above 2½ inches, showing the great range of variation in size of young Salmonidæ raised from eggs and milt obtained at one time from the same parents although the resulting offspring are kept under exactly similar conditions of existence.

I remarked in the paper referred to, that on Nov. 29, 1883, 4500 eggs of the Lochleven Trout (of the season of 1875) were milted from the parr of a Salmon raised at Howietoun<sup>2</sup>, and the eggs were placed in hatching-box No. 88. The number of eggs removed as dead during the following months were as follows:—in December

<sup>1</sup> I have carefully compared M. Jourdan's account of the Cuvierian organs with the interesting account given by my friend Mr. J. E. Blomfield (Q. J. M. S. xxii. p. 355) of the thread-cells of *Myxine*, but I cannot detect any points of similarity. Perhaps M. Jourdan will, in the further investigations which he has promised to make, direct especial attention to Mr. Blomfield's account of *Myxine*.

<sup>2</sup> An error appears in my former paper, at page 19, these fish having been hatched in March 1881, not 1882.

65, in January 18, and in February 4, or a total of 87 deaths, while an additional 199 eggs were found not to have been originally impregnated. From the foregoing experiment we can draw the conclusion that the mortality was only 1 in 46 eggs, when those of mature Lochleven Trout were milted from immature Salmon-parr.

But although this mortality was only slightly in excess of 2 per cent. of the eggs, such by no means gives a true index to the result of the experiment, for it was soon perceived that the milt of the parr (at least in this instance) was insufficient to satisfactorily impregnate the eggs of the Trout, in order to raise a strong and vigorous brood of alevins, while weak ones are useless for stocking purposes, even should they overcome the diseases and dangers of their youth.

On February 15, 1884, some thousands were hatched from these eggs, but nearly all were seen to be suffering from what has been termed dropsy, or blue swelling of the yelk-sac. This non-contagious disease, as observed by Livingston Stone, is one for which no remedy is known, and concerning which he remarks no cause for its origin had been ascertained. Appearances led me to the belief that in this instance such must have been due to insufficient vitality in the young, a consequence of the imperfect fecundating power of the milt. In that such cannot be due to simply crossing these two forms, is evident from the 212 examples of hybrids between the male Salmon and female Lochleven Trout, and which are now in the octagon pond at Craigend, as I have observed upon.



Fig. 1. *Salmo levenensis*, 29 days old.

Fig. 2. ———, 43 days old.

Fig. 3. ——— *fontinalis* ♂, *Salmo levenensis* ♀, 27 days old.

Fig. 4. ——— *salar* ♂, *Salmo levenensis* ♀, 27 days old.

Fig. 5. ———, ———, 41 days old.

Fig. 6. ———, ———, 91 days old.

March 12, 1884, I first saw these young fish, then almost one month old, and their average length being 0·8 of an inch; but what at once struck an observer was the large and pyriform umbilical sac, which seemed to anchor them to the bottom of the tank; some were thus seen singly, others in groups, while every now and then one would start up and swim a short distance in an irregular or spasmodic manner, and then subside to the bottom. This dropsical enlargement in a considerable proportion of the fish was 0·35 of an inch in length, and 0·2 of an inch in diameter where it was widest, while it stood out in tolerable relief from the enclosed yellow yelk-

sac, showing the existence of two coats, separated one from another by an accumulation of clear fluid. Under a strong glass there appeared to be a want of vitality in the fish, the pulsations being feeble, the activity of the heart being less than in more healthy forms, and a deficiency of red corpuscles in the blood. Due to this dropsical distension, the pectoral fins were much impeded in their movements, which is very material, because in the young fish these fins are in constant motion, in order by keeping up a continuous current to help the gill-covers in aerating the blood at the gills, for the gills at this early period of life are partially uncovered, although not free as seen in foetal plagiostomes.

Another experiment made at the same time leads to a corroboration of my belief that the milt of these young Salmon-parr is deficient in marital powers, for, as I previously remarked, 1000 eggs of the common Brook-trout were milted from one of these Salmon-parr which had been dead a few hours. The result in this instance has been that not one single egg was fructified. Only 3 eggs turned white in December, 3 in January, and 15 in February, or a total of 21; and on March 12 the remainder were still quite clear, but without a sign of an embryo within.

It has been remarked at Howietoun, that eggs from young mothers are subject to a greater percentage of deaths than those taken from older fish, and this raises the conjecture that, similarly, the marital power of milt from young males may possess less fertilizing properties than that obtained from older parents.

On March 26, Sir J. Gibson-Maitland sent me specimens of these hybrids, the largest of which was 0.7 inch in length, and the comparative size of the dropsical swelling, as may be seen from the diagrams on the wall, or the examples on the table, had considerably augmented in size. From this period these fish commenced dying off, and by May 15 none of those which suffered severely with dropsy were left, but about 400 that from the first had not been so weakly as the others. One of these I received alive from Howietoun, sent in a small glass bottle of water (containing rather less than half an ounce) through the post; after arrival it lived 43 hours in a tumbler. Its length was 0.8 of an inch, or the same as was the average of those I measured on March 12, when nearly one month old: the specimen is on the table.

The other experiments I will now briefly chronicle. On November 29, 1883, 3695 (formerly printed 2695) eggs of *Salmo fontinalis* were milted from a parr of *Salmo salar*. In December, 144 dead eggs were removed, during January 1527, and in February 401, or a total loss of 3372 ova. On March 12, 1884, 7 were alive, but not in a satisfactory condition.

On November 15, 1882, 2000 ova from a Lochleven Trout were milted from a *Salmo fontinalis*; on November 29, 1883, 150 were estimated to be alive, but this must have been too low a number—250 seems to be more probably nearer the mark. These have been kept in a large wooden box, rather exposed to the east, but still had done comparatively well up to this time. On this day, March 12,

1882, upwards of 20 were found to be dead, so the next day they were removed to the upper pond at Howietoun, into which 211 were placed; some, however, seemed to be very weakly. In three of these fish a remarkable change had occurred as to the colour of their fins, the ventral, anal, and caudal having become of a carmine-red. One, which was  $2\frac{1}{4}$  inches long, happening to die, I found that its left eye had never been developed, while there were adhesions between the iris and subjacent structures in the left eye. The longest fish was a little over  $3\frac{1}{2}$  inches in length.

On November 29, 1883, 3000 ova were taken from a Lochleven Trout of the season of 1875, and milted from a *Salmo fontinalis*. The number of dead eggs removed were as follows:—80 in December, 56 in January, 25 in February, or a total loss of 161; while 296 were found not to have been impregnated, or a proportion of 1 death in 17 ova. These young fishes were far more advanced than the dropsical forms previously alluded to.

On November 15, 1882, 8000 ova of *S. fontinalis* were fecundated with milt from a Lochleven Trout, and on November 29, 1883, only 16 were alive. They were kept under the same conditions as the last, and on March 13, 1884, only 8 were remaining, and these in an unsatisfactory condition. They were removed to Howietoun planked pond on that day.

On November 12, 1883, some eggs from *S. fontinalis* were milted from a Scotch trout; and in November 28, in December 193, and in January 1028, or a total of 1449 dead ova were removed. On March 13, 1884, there appeared to be about 500 young fish doing well.

On November 15, 1882, 9000 ova of *S. fontinalis* were milted from a Scotch Charr, *S. alpinus* var. *struanensis*, and no monstrosities as observed among the other crosses resulted. On March 13, 1884, 91 lively young fish were transferred to No. 1 upper planked pond at Howietoun.

On December 1, 1883, some American Charr-eggs were milted from a Scotch Charr, and the following is the monthly record of the mortality:—January 138, February 787, March 194, or a total of 1119. On March 13, 1884, upwards of 100 young were present.

I shall defer making any remarks on the foregoing simple statement of results until the experiments have been further developed by time; but I cannot resist calling attention to the following point, as it seems desirable that information on such should be obtained from the widest sources.

If hybrid Salmonidæ are to be worth rearing, of course the fish-culturist would desire to obtain the finest breed; and the first subject that deserves inquiry is whether the species among vertebrate animals which forms the male or the female parent exercises any peculiar modifying influence on the size of the offspring. Dr. Gray remarked that among hybrids the offspring attained to the size of the largest parent; but he does not appear to have considered that it was of any consequence whether this larger parent should have been the male or the female, and if it is, such a point is most desirable

to ascertain as bearing on the crossing of Salmon and Trout. When we examine the lower animals we are told that should we cross the female Ass with the Horse stallion we obtain a *hinny*, in which the head is like that of the father, the ears those of the Horse, as is also the neigh, the size following the female. If, on the other hand, we take a Mare, and cross it with an Ass, we obtain a *mule*, wherein the head is asinine, with long ears, &c., while it brays, and here likewise size may be said to follow the mother. I have been examining some interesting crosses among Pheasants at Col. Smyth's; he has crossed the male Amherst with the female Golden Pheasant, and the head of the young is unmistakably that of the Amherst. He reversed the experiment, the Golden Pheasant being the father, and the head and the generality of the plumage certainly takes after the father. I have seen some other instances which would seem to follow the same course, wherein the male appears to have had the largest share in the production of the appearance of the offspring; but I have likewise been shown an instance in which the species of the mother appears to have had the greatest proportion in the plumage of the young.

I simply draw attention to this question as one which may or may not have any modifying influence on the offspring, and to ask those who may be in positions to observe any results which ensue, to kindly note them down for future information.

The experiment with the young Trout reared from the parents of 1875 or 1876 continues to afford the same results as formerly noticed, young reared from the larger eggs giving the finest offspring. The fish in both ponds have grown considerably during the winter months.

Respecting the young Canadian Salmonidæ hatched at the Fisheries Exhibition by Mr. Wilmot on and after May 1, 1883, a considerable number are still alive. I went carefully through them April 24, 1884, when they were not a year old. Many were in their parr livery, and merely 2 to 2½ inches long, and from this all intermediate lengths were present up to a batch of 10 fry which were kept in a tank by themselves, and had attained from 5½ to 6 inches in length. Two of these last were perfectly silvery smolts, destitute of any finger-marks, while in the other eight faint vertical bands were visible, while none had any red spots. The fins were very dark, and there were numerous black spots over the upper half of the body. On May 5 I found these smolts were becoming very restless, and although in some the lateral bands were visible, they were very faint. The colour of the body from the adipose dorsal (or in some from just posterior to the rayed dorsal) to the caudal fin had become very black, while if anything all the fins appeared to be darker.





J. Smit lith.

Hanhart imp.

PHALANGISTA LEMUROIDES.



P.Z.S. 1884. Pl. XXXII.



J. Smith del.

Hannart imp.

DENDROLAGUS LUMHOLTZI.

## 5. On some apparently new Marsupials from Queensland.

By ROBERT COLLETT, C.M.Z.S.

[Received May 13, 1884.]

(Plates XXIX.—XXXII.)

A Norwegian traveller, Dr. Lumholtz, of Christiania, who has now spent four years in Northern Queensland, collecting specimens of natural history for the University of Christiania, has just sent to our Zoological Museum a fine collection of mammals, birds, reptiles, and fishes, besides invertebrates. In giving these short descriptions of a few of the mammals, which I think may be undescribed, I take the opportunity to offer my best thanks to my friend Mr. Oldfield Thomas, for the kind assistance he has given me when examining the skins of the Marsupials in the British Museum, and comparing them with Dr. Lumholtz's specimens.

## 1. PHALANGISTA (PSEUDOCHIRUS) ARCHERI, sp. nov. (Plate XXIX.)

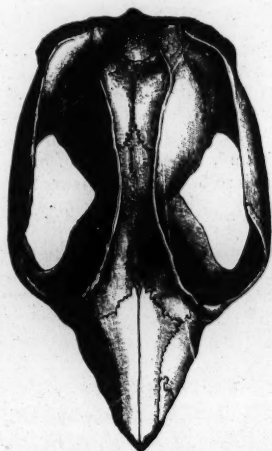
*General characters.*—*Male.* Mottled yellowish green above, with whitish lines on the back; lower side white. Tail with short hairs on its apical third. Ears short, rounded, with short hairs.

*Description.*—Upper parts a peculiar mixture of yellowish green, white, and grey, the root of the fur bluish grey; two indistinct stripes of silky white are visible on the back, the tips of their hairs being yellowish; a short and narrow black line from occiput along the middle of the nape. Lower parts white; the chin greyish white. Head: snout ashy grey; a white semilunar spot under the ear, and a small pale yellowish one above and under the eye; the eyelids are dark brown. Ears short, almost hidden in the fur, greyish externally, bordered with white; hairs short; inner surface almost naked. Nose fleshy brown; the naked area narrow below (3 millim.), the upper lip being haired almost to the central groove. Limbs yellowish grey, the base of the hairs grey like the back; the fore limbs whitish on inner side. Claws pale yellow. Tail on its first third very thickly clad with woolly hairs, yellowish grey above and underneath, everywhere with interspersed long whitish hairs; the apical third (short-haired part) whitish; the naked line on lower surface of moderate length, not reaching half the length of the tail.

*Skull.*—Much like the skull of *Phalangista albertisii*, described by Peters and Doria in Ann. Mus. Genova, vol. xvi. tab. viii. and ix. fig. 2. *Ph. archeri* differs, however, in having the parietal crests diverging and finally converging, instead of regularly converging, as in *Ph. albertisii* (if the figures on the plates quoted are correct). In *Ph. archeri* the profile of the skull seems more oblique in the post-parietal region and the nasal bones to be shorter behind, as in

*Ph. albertisii*. Length of the skull 65 millim., the greatest breadth 39 millim.

Fig. 1.



*Phalangista archeri* ♀.

Skull, view as seen from above.

*Teeth* much like those of *Ph. albertisii*. In the upper jaw the incisors are 3 in number; the first long, canine-like, its length from the maxillary 5 millim.; the second short, compressed, with flattened crown, more like a small premolar; the third very small, shorter than the canine (in *Ph. albertisii* the canine is the longer of the two). The canine is small, pointed. The first premolar small (very much like the third incisor); the second somewhat larger, with two cusps; the third still larger, and with two large and two small cusps. The four molars large.

In the lower jaw the incisor is very large, directed almost horizontally, its length from the mandible 8 millim. The next tooth is very small, close to the root of the incisors, and may be regarded as the second incisor. The single premolar large, but not broad, with three cusps. Then follow the four molars, much like those in the upper jaw.

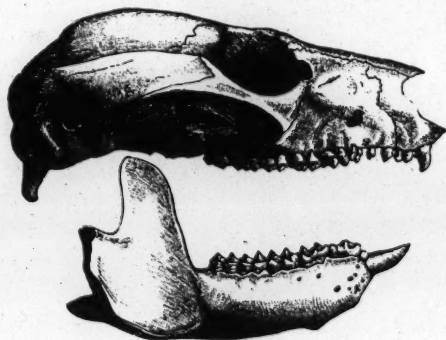
In the upper jaw the canines and the first premolar are separated from the other teeth by a short distance; in the lower jaw all the teeth are closely set.

Dental formula:—m.  $\frac{4}{4}$ , p.  $\frac{3}{1}$ , c.  $\frac{1}{0}$ , i.  $\frac{3-3}{2-2}$ , c.  $\frac{1}{0}$ , p.  $\frac{3}{1}$ , m.  $\frac{4}{4}$ =36.

Length of the body about 300 millim., of the tail about 290 millim.

*Hab.* Northern Queensland, legit Dr. Lumholtz, 1883. (One specimen, preserved in the University Museum, Christiania.)

Fig. 2.



*Phalangista archeri*, ♂.

Side view of skull. Side view of lower jaw.

## 2. PHALANGISTA HERBERTENSIS, sp. nov. (Plate XXX.)

*General characters.*—Brownish black above; lower surface white or whitish. Tail with short hairs in its apical third. Ears small, black.

*Description.*—*Male.* Upper parts: head with chin and back blackish brown, with numerous interspersed reddish-brown hairs; the root of the fur blackish. Lower parts white, this colour covering the throat, belly, and inner side of the limbs. Ears short, rounded, black, with short hairs; length from their anterior base 13 millim. Nose broad, blackish, the shortest breadth of the naked area being 8 millim. Limbs black, with a broad white ring round the elbows; the hind feet black above, white on inner side. Claws pale yellow. Tail deep black, the apical third white; the naked line on lower surface very long, about two thirds of the length of the tail.

Length of the body about 310 millim., of the tail 280–300 millim.

*Female.* Another specimen from the same locality, a female, comes very near the male described above; but the lower surface is not snowy white, but greyish white, and no trace is visible of the white ring round the elbows. The back is of a more reddish brown.

*Skull.*—A deep groove between the frontal crests; the parietal

crests are flattened behind<sup>1</sup>, and converge towards the occipital bone. The nasal bones converge to a common truncated point in the frontals.

Fig. 3.



*Phalangista herbertensis*, ♀.  
Skull, viewed from the top.

**Teeth.**—*Upper jaw.* The incisors are three, closely set; the first is large (length from the maxilla 5 millim.), but is only half the length of the first lower incisor; the second and third are small. The canine is separated by a considerable space from the incisors and the first premolar: it is small (of the same size as the second and third incisors). The first premolar small, not larger than the canine; second premolar larger, with 1-2 cusps; third still larger, but not reaching the size of the molars, dilated behind, and with 2-3 cusps. The four molars are large.

*Lower jaw.* The first incisor is very large, its length from the mandible 10 millim., directed horizontally; the second incisor is rudimentary, hardly projecting above the gum, and only visible in the skull. The canine is as rudimentary as the second incisor, and in both skulls only visible on one side. The single premolar situated close to the molars, and of nearly the same size, but wanting the central groove. The molars four; their series perfectly straight.

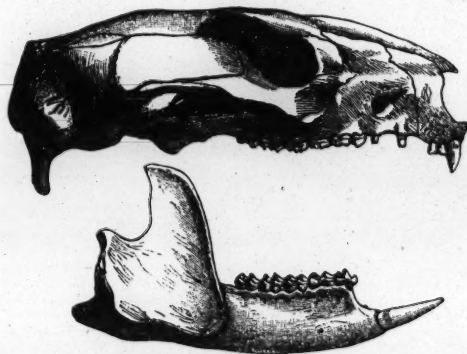
Dental formula:—m.  $\frac{4}{4}$ , p.  $\frac{3}{1}$ , c.  $\frac{1}{1}$ , i.  $\frac{3-3}{2-2}$ , c.  $\frac{1}{1}$ , p.  $\frac{3}{1}$ , m.  $\frac{4}{4}$ =38.

<sup>1</sup> In the female; the skull of the male is immature.

*Hab.*—Herbert Vale, Northern Queensland; legit Dr. Lumholtz, 1883. (Male and female, preserved in the University Museum, Christiania.)

*Note.*—*Ph. herbertensis* differs from *Ph. viverrina*, Ogilby (hitherto not very fully described), by its small ears and its brownish back.

Fig. 4.

*Phalangista herbertensis*, ♀.

Side view of skull. Side view of lower jaw.

3. PHALANGISTA (HEMIBELIDEUS) LEMUROIDES, sp. et subg. nov. (Plate XXXI.)

*General characters.*—*Female.* Dark brownish grey, lower surface dirty yellow. Tail equally bushy to the tip, cylindrical. Ears small, rounded. Snout short. Eyes small.—This subgenus (*Hemibelideus*) forms evidently a transition stage between the true *Phalangers* and the genus *Petaurista*, having the skull, but not the patagium, of the latter, and the bushy cylindrical tail, but not the skull, of the *Phalanger* subgenus *Trichosurus*.

*Description.*—Upper parts dark brownish grey with silky gloss, grizzled with reddish brown on shoulders and ashy grey on lower back. An ill-defined black line from the nape down the back. The root of fur blackish-grey. Lower parts dirty yellowish grey, a clearer grey on the throat and inner side of the feet. Head coloured like the back, the face more interspersed with greyish hairs. Ears short, naked on inner surface; length from their anterior base 13 millim. Snout remarkably short and slender, the eyes small; distance from the eye to the tip of the nose 20 millim. The naked part of the nose small, blackish. Claws light grey. Tail bushy to the tip, the hairs of moderate length, black, lower side more greyish

on its first third. The naked line on lower surface of the tip very short.

Length of the body about 320 millim., of the tail about 290 millim.

Skull and dentition more like those of the Flying Phalangers (genus *Petaurista*) than of the true Phalangers of the subgenus *Trichosurus*, with which it has in common the bushy tail, but from which it is widely different in its skull and dentition. Frontal crests sharply defined from the beginning of the nasals; the parietal crests

Fig. 5.



*Phalangista lemuroides*, ♀.

Skull, seen from above.

widely diverging backwards. Frontals forming a common angle anteriorly, dividing the hind margin of the nasals.

*Teeth.*—*Upper jaw.* The three incisors closely set; first incisor long, separated by a short space from the other first incisor; its length from the maxillary is 4 millim. Second and third both small, the third being the smallest. The canine small, separated by a space from the incisors and the first premolar. First premolar very small, separated by a short space from the second; in size it is the smallest tooth in the jaw. Second premolar only half the size of the third, with two cusps; the third has three cusps. The four molars form a rather curved series, considerably converging behind.

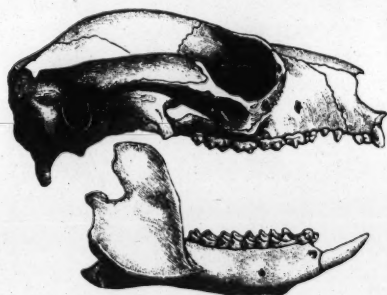
*Lower jaw.* Incisor long, its length from the mandible 8 millim., horizontal; second incisor absent; canine none. The single premolar rather large, but inferior in size to the true molars, and lacking the central groove. The molars forming a slightly curved series.

Dental formula:—m.  $\frac{4}{4}$ , p.  $\frac{3}{1}$ , c.  $\frac{1}{0}$ , i.  $\frac{3-3}{1-1}$ , c.  $\frac{1}{0}$ , p.  $\frac{3}{1}$ , m.  $\frac{4}{4}$ =34.

*Hab.* Northern Queensland; legit Dr. Lumholtz 1883. (Female and young, preserved in the University Museum, Christiania.)

*Note.*—The young specimen, only half grown, is in every respect similar to the full-grown female except in size.

Fig. 6.



*Phalangista lemuroides*, ♀.

Side view of skull. Side view of lower jaw.

#### 4. DENDROLAGUS LUMHOLTZI, sp. nov. (Plate XXXII.)

*General characters.*—Yellowish grey, the back grizzled with blackish; snout, ears, fingers, toes, and occiput black; the tail black on lower surface.

*Description.*—Upper parts grey; on the back the hairs are blackish with pale bases and points, giving these parts a grizzly hue. On the vertex of the back the hairs are almost uniformly black, extending as a broad stripe upwards, and covering the occiput and the ears on their outer surface. The lower back is clearer yellowish grey, the blackish hairs being somewhat scarcer, but forming an indistinct dark patch on the root of the tail. Lower parts pale yellowish, deeper on the flanks; the throat whitish. Limbs coloured on upper surface like the back; on the metacarpus and metatarsus rusty red, with numerous interspersed black hairs. Fingers and toes deep black. Claws black. Head: the snout, chin, and lower jaw black; the forehead grey, in some specimens more blackish or almost black. Tail pale yellowish grey above, with numerous black hairs; lower surface black or blackish; the tip in some specimens whitish. Ears short, covered with moderately long hairs; external surface black, inner pale yellow.

*Skull.*—The skull and dentition seem not to differ in any essential way from that of the Papuan *Dendrolagi*.

Length of the body about 700 millim., of the tail about 680 millim.; but the species is said to obtain a much greater size.

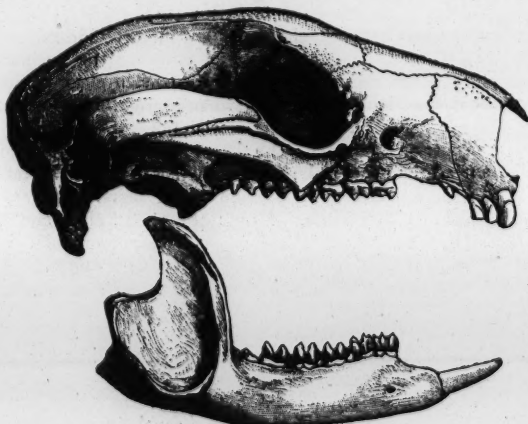
*Hab.* Herbert Vale, Northern Queensland; legit Dr. Lumholtz,

Fig. 7.



*Dendrolagus lumholtzi.*  
Skull seen from above.

Fig. 8.



*Dendrolagus lumholtzi.*  
Side view of skull. Side view of lower jaw.





J. Smit lith.

Hanhart imp.

SPHINGURUS SPINOSUS.

1883. (5 specimens and one incomplete, preserved in the University Museum, Christiania, one in the British Museum.)

*Note.*—Two of the specimens are young, scarcely half grown, but they show no essential difference in colour from the other specimens.

---

June 3, 1884.

Prof. A. Newton, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1884:—

The total number of registered additions to the Society's Menagerie during the month of May was 213, of which 77 were by presentation, 88 by purchase, 19 by birth, 22 by exchange, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 213.

The most noticeable additions during the month of May were as follows:—

1. A Tree-Porcupine, purchased May 1st, but which unfortunately died in a few days.

The specimen belongs to a species remarkable for its brightly coloured spines and short hair, as shown in Mr. Smit's drawing (Plate XXXIII.), and is probably referable to *Sphingurus spinosus* of F. Cuvier, which is new to the Society's Collection<sup>1</sup>.

2. Four Soft-billed Ducks (*Hymenolæmus malacorrhynchus*), received May 17th from the Acclimatization Society of Carterbury, New Zealand. Of this fine species we have previously received but one living specimen (see P. Z. S. 1876, p. 463). The present birds are in excellent condition, and will, it is hoped, serve to establish this species in Europe.

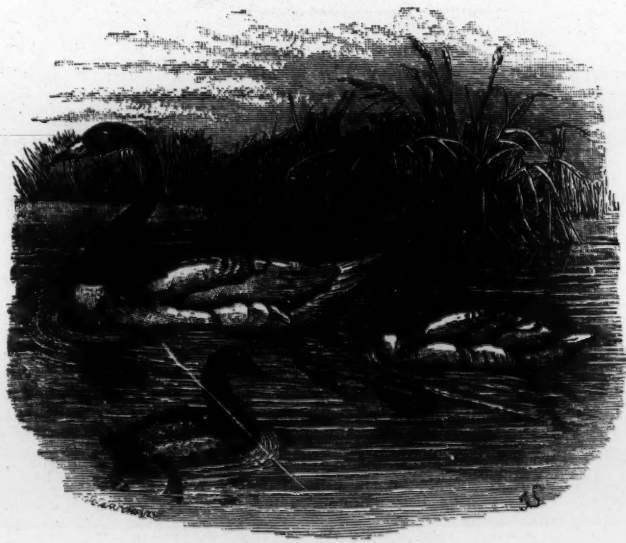
3. Two pairs of Francolins, obtained by Mr. E. Lort Phillips, F.Z.S., near Berberah, on the Somali Coast, and presented by him May 23rd. The larger pair of these birds are referable to the Red-throated Francolin (*Francolinus rubricollis*, Rüppell), of which a single specimen has been previously in the Society's collection. The smaller pair seem to belong to the rare Kirk's Francolin (*Francolinus kirki*), described by Hartlaub and Finsch in their 'Ornithology of East Africa' (Vögel Ostafrikas, p. 588) from a specimen transmitted by Dr. Kirk.

---

<sup>1</sup> The species was founded by F. Cuvier in 1822 (Mém. Mus. d'H. N. ix. p. 433) upon a specimen in the Paris Museum, which he refers to the "*Cuiq*" of Azara (Apunt. ii. p. 55). Mr. Waterhouse, with whose description (N. H. Mamm. ii. p. 421) the present specimen accords very fairly, well points out that M. I. Geoffroy St.-Hilaire's suggestion (Dict. Class. d'H. N. xiv. p. 216) that *S. spinosus* is merely a seasonal variety of *S. villosus*, is hardly tenable. With this view I quite agree. *S. spinosus* seems to me to be a distinct species recognizable by bright tricolour spines of the upper surface, and the entire absence of hairs amongst them. The total length of the body of the present specimen (which has been acquired by the British Museum) is 15 in. and of the tail 11 in.—P. L. S.

The following extract was read from a letter addressed to the Secretary by Mr. Albert A. C. le Souëf, C.M.Z.S., dated Melbourne, April 8th, 1884:—

"A strange thing occurred in my garden a few months ago which may interest you. A Black-necked Swan (*C. nigricollis*) commenced sitting on three eggs last August. The keeper tells me that a few days before her time of hatching he found one of the eggs had rolled out of the nest and had been broken, the egg containing a dead cygnet, leaving two eggs under the parent bird. These were hatched on the 13th of September; but, to my astonishment and the



Cygnets of *Cygnus nigricollis*.

keeper's, produced three cygnets. At first the cygnets were nearly of a size; but in a very short time one commenced to grow much faster than the other two. The birds are now nearly seven months old; and I send you a sketch of them as they now are. The bird out of one of the eggs is as large as the parents; but the two out of the other egg are much smaller. The largest of the two has a little colour on the neck; but the second is a queer little fellow, and, although apparently quite healthy, is still covered with down, and looks as if it were only two months old. I was not aware that double-yolked eggs produced in this manner, and I shall be glad to know if a similar occurrence has ever come under your notice."

---

The following papers were read:—

1. On some Points in the Structure of *Hapalemur griseus*.

By F. E. BEDDARD, M.A., F.Z.S., Prosector to the Society.

[Received June 3, 1884.]

A male *Hapalemur griseus* was purchased by the Society in March 1883, and its arrival at the Gardens was recorded by Mr. Selater in the 'Proceedings' for that year (P. Z. S. 1883, p. 178). On March 17th of the present year it died and came into my hands for dissection.

So far as I am aware, there is no published description of the anatomy of the soft parts of this Lemur; and our knowledge is at present limited to its external characters, and to the dentition and osteology, which have been described by Prof. Mivart<sup>1</sup>, who places the genus *Hapalemur*, together with *Lepilemur* and *Lemur*, in his sub-family Lemurinae.

I may commence by a few words about the species of *Hapalemur*.

The genus *Hapalemur* was originally founded by Isidore Geoffroy St. Hilaire<sup>2</sup>, who distinguished two species, *H. griseus* and *H. olivaceus*. These were regarded by him as distinct not merely by reason of the different colour of the fur implied by the specific name of each, but also on account of certain differences in the form of the lower jaw, the exact nature of which is, however, not stated.

In their 'Faune de Madagascar'<sup>3</sup> Schlegel and Pollen united these two species under the name of *H. griseus*; the differences between the two not being regarded by these authors as of specific value.

In 1870<sup>4</sup> Dr. J. E. Gray briefly described a third species of *Hapalemur*, to which he gave the name of *H. simus*, distinguishing it from *H. griseus* by a number of osteological characters as well as by the colour of the fur. The differences indeed between the two species appeared to Dr. Gray to be of sufficient importance to warrant the separation of *Hapalemur simus* as a distinct subgenus, to which the name *Prolemur* is applied.

In a postscript added to this paper Dr. Gray writes that his *Hapalemur simus* appeared to be in reality the same species as that described by Pollen and Schlegel as *Hapalemur griseus*, inasmuch as their figure<sup>5</sup> of the skull of this species shows the "truncated form of the nose and the wide palate" which is characteristic of *Hapalemur simus*, and is not to be found in the species known in England as *Hapalemur griseus*.

Quite recently Dr. Schlegel has written a short paper in the 'Notes from the Leyden Museum'<sup>6</sup> criticizing Dr. Gray's definition of *Hapalemur simus*, and stating that the alleged differences in the form of the skull between this species and *H. griseus* have no existence, and that a careful comparison between the two species only

<sup>1</sup> P. Z. S. 1864, p. 611, and 1873, p. 484.

<sup>2</sup> 'Catalogue des Primates,' p. 75.

<sup>3</sup> 'Faune de Madagascar,' 1868, t. i. p. 6.

<sup>5</sup> *Loc. cit.* pl. 7. fig. 4.

<sup>4</sup> P. Z. S. 1870, p. 828.

<sup>6</sup> Vol. ii. p. 45.

shows certain differences in size and in the colour of the fur, *Hapalemur simus* being recognizable by the presence of a spot of a uniform pale yellowish rusty colour occupying the end of the rump and the upper part of the base of the tail, &c.<sup>1</sup>

I have myself had the opportunity of comparing the skins as well as the skulls of *Hapalemur griseus* and *H. simus*; and the most obvious difference between the two species, which does not seem to have been noticed either by Gray or Schlegel, is a patch of spines upon the arm of the former. This is figured in the drawing (fig. 1, p. 393), and described more fully below.

With regard to the differences in the skulls of the two species, I have been able to verify Dr. Gray's statements with the exception of what he says about the lower jaw, and the description here appears to me to have been accidentally reversed. "Lower jaw weak, and narrow in front, with a short symphysis," was, I think, meant rather for *H. griseus*; while the description of the lower jaw of *Hapalemur griseus*, "Lower jaw broad and strong in front, with a long symphysis" should be applied to *Hapalemur simus*. It seems to me also that Gray was right in believing that Schlegel and Pollen's figure of the skull of *Hapalemur griseus* was in reality that of *Hapalemur simus*.

*External characters.*—In the Lemuroidea<sup>2</sup> generally there is some diversity in the development of the digits both of the hind and fore limbs, though in all (as contrasted with the Apes) the pollex and hallux are invariably present and well developed. A very usual character—and in this respect *Hapalemur* agrees with other Lemurs—is that the nail of the second digit of the foot is considerably elongated and claw-like.

The fleshy pads on the palmar surface of the hand and foot in *Hapalemur griseus* are very closely similar to those of *Lemur*. A large pad (Fig. 1, *a*), broader in front than behind, extends from the root of the thumb to as far back as the wrist; a second pad (*b*) lies at the base of the index; a third (*c*) between the roots of the two succeeding digits; another pad (*d*), the same size as the last but slightly smaller than that of the index, lies at the root of the fifth digit, and behind is another long pad (*e*) as large as that on the radial side of the hand, which extends as far back as the wrist.

In the foot there is a large pad on the inner side of the base of the hallux; another smaller one between this and the succeeding digit; at the root of the index is a larger pad; between the roots of the third and fourth digits is another pad about half the size of the last, and divided by a furrow into a larger outer and much smaller inner portion; at the root of the fifth digit is a small circular pad, and behind it, reaching as far as the wrist, a long narrow pad; on the radial side of the hand close to its posterior margin is a small pad.

The colour of the palmar and plantar surfaces of the hand and

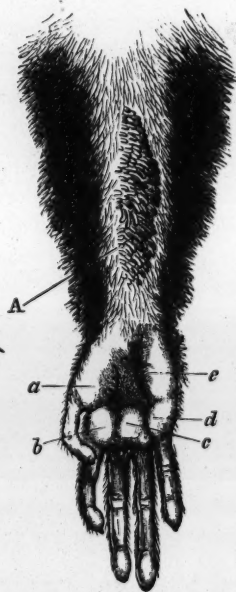
<sup>1</sup> *Loc. cit.* p. 49.

<sup>2</sup> Cf. Murie and Mivart's 'Anatomy of Lemuroidea,' Trans. Zool. Soc. vol. vii. p. 9, &c., for a comparison between the hands and feet of different Lemurs.

foot are black as in *Lemur*; and in both these genera the interspaces between the pads are occupied by small isolated nodules of horny integument. In *Perodicticus* and *Nycticebus*, on the other hand, the palms of both the feet and the hands are flesh-coloured, and the interspaces between the pads are traversed by irregular creases and not separated into distinct and isolated nodules of horny matter.

On the inner side of the arm close to the wrist is an oval patch of spine-like processes, about one inch long and one third of an inch broad in the middle, which is shown in the accompanying drawing (fig. 1, A). These spines are longest in the middle portion of the

Fig. 1.

Hand of *Hapalemur griseus*.

patch, and decrease in length towards both extremities. Examined with a hand lens they present the appearance of being composed of a number of finer threads closely bound together; the extremity of the spines is blunt, and the longer ones are somewhat curved and overlap each other. The patch of integument which bears these spines is sharply marked off from the surrounding integument, and no transitional forms between the hairs of the general body-surface and these peculiar spines could be observed. The Natural-History

Museum at South Kensington contains skins of *Hapalemur griseus*, all of which with one exception (a very small, probably immature specimen) show the character that has just been described. In these specimens, however, there are no means of ascertaining the sex, and accordingly it is not possible to be quite certain whether this patch of spines is common to both sexes, or is a secondary sexual character confined to the males, though on the whole the evidence seems to point to the conclusion that it is not peculiar to the males.

So far as I am aware this structural character has not been hitherto described in this or any other Lemur, and it seems to be confined to this one species. I have examined the single specimen of *Hapalemur simus* in the Natural-History Museum, and it shows no traces whatever of any such structure, nor can I find any thing like it in other Lemurs.

When the skin covering the arm was removed, an oval gland about the size and shape of an almond was seen to correspond to this patch of spines; but I could not ascertain whether there was any direct relation between them, since the duct, if any such existed, was destroyed by removing the skin. The gland was equally well developed upon both arms.

Although the specimen to which the present description relates is a male, well-developed mammary glands were found to exist. The apertures of these glands are upon the arm; and on removing the skin the glands themselves were found to be attached by membrane to the *pectoralis major*, the *biceps*, and part of the *deltoid* muscles. The position therefore, as well as the actual occurrence of these mammary glands, appears to be abnormal.

The *palate* is traversed by eight transverse ridges, of which the five anterior and the last are complete and pass from side to side without any break: the two middle ridges are interrupted in the median line. The shape of these palatal ridges, which increase in breadth progressively from before backwards, is like that of the figure 3: each half of the ridge is semicircular with the convexity directed forwards; in the middle of the palate the two semicircles meet at an angle which becomes more acute in the posterior ridges; in the anterior two ridges this angle is hardly at all marked, and the whole ridge forms a single continuous semicircle with the convexity directed forwards. The same may be said of the terminal ridge.

Each ridge passes from a given point on one side of the mouth to the corresponding point on the other: the first connects the bases of the two canines, the second passes from the interval between the two anterior premolars to the same point on the opposite side of the mouth. The third and fourth similarly connect the intervals between the succeeding premolars and molars with those of the opposite side; but the fifth ridge in the specimen examined by me is irregular, arising on the right side from the interval between the last premolar and first molar close to the ridge in front, but terminating on the left side in the interval between the first and the succeeding molar tooth, close to the ridge behind. The sixth and seventh ridges connect the intervals between the last molars of one side with the other; and the eighth

ridge, which bounds the posterior margin of the hard palate, arises a short way behind the last molar. The hard palate is distinguishable from the soft palate by its greenish colour.

The *tongue* is covered on its posterior half with a closely-set mass of large, conical, backwardly-directed papillæ; the anterior half is also covered with small papillæ, but looks almost smooth by comparison; the free tip of the tongue is slightly frayed out in a brush-like fashion. The *sublingua*, so characteristic of the Order, is well developed in *Hapalemur*, and furnished on the under surface with three folds, of which the median one is the strongest.

Beneath the sublingua is a bifid projection of the mucous membrane of the mouth, which is so largely developed that it has quite the appearance of a *third tongue*. This structure, which is also to be seen in *Perodicticus* and *Arctocebus*, appears to be the projecting termination of the ducts of the submaxillary glands.

The *stomach* is about 2 inches long, the greater portion by far belonging to the cardiac division of the organ; the entrance of the œsophagus is close to the exit of the duodenum. At the pylorus there is a complete circular valve, which separates the stomach from the duodenum, and which is considerably broader and thicker above than below. The mucous membrane lining the cavity of the stomach is raised into a few irregular longitudinal ridges.

The *small intestine* measures 2 feet 4 inches in length, while the *large intestine* is only 1 foot in length. The Peyer's patches, which in man are confined to the ileum, extend into the cæcum of *Hapalemur* and nearly as far as the termination of the colon. In the cæcum are two circular Peyer's patches, situated one in front of the other about the middle of its length, besides a number of "solitary" follicles. In the colon I counted 10 "agminated" follicles, the first placed at about an inch from the ileo-cæcal valve; there were also a great number of solitary follicles. In the small intestine there is a large Peyer's patch, about 1 inch from the ileo-cæcal aperture, and another nearly 2 inches behind this; further back still there were two others. The Peyer's patches of the small intestine are covered with villi.

So far as I am aware this is the first recorded description of Peyer's patches in the large intestine of any Lemuroid<sup>1</sup>.

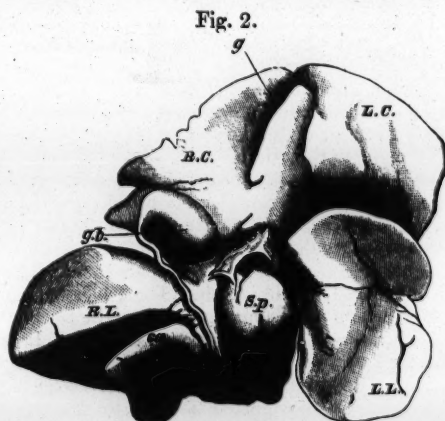
The *large intestine* is slightly wider than the small intestine; its outer surface, like that of the cæcum, is perfectly smooth and devoid of sacculations.

The *cæcum* is very simple; it is an oval sac hardly perceptibly narrower at its blind extremity; the surface is quite smooth, without any sacculations. The entrance of the ileum is guarded by a circular valve; about an inch from the ileo-cæcal aperture the cæcum passes gradually into the colon. The total length measured from the exit of

<sup>1</sup> Dr. G. E. Dobson, F.R.S., has discovered and recorded the presence of Peyer's patches in the rectum of *Myogale* and other species of Moles (Monogr. Insectivora, Pt. ii. p. 172, pl. xxii. fig. 5); and the same author informs me that he is about to publish in the next number of the 'Journal of Anatomy and Physiology' a description of these structures in the cæcum and colon of several Insectivora and Rodentia.

the colon to the blind extremity was about  $3\frac{1}{2}$  inches, the breadth nearly  $1\frac{1}{2}$  inch. The small cæcum of this Lemur recalls that of *Arctocebus*<sup>1</sup>, and differs widely from the long tapering cæcum of *Lemur* and the *Indrisinæ*.

*Liver*.—The liver of *Hapalemur griseus* differs somewhat in detail from that of other Lemurs; the left lateral lobe (fig. 2, *L.L.*) in most Lemurs appears to be the larger of the four principal lobes; in *Hapalemur griseus* it is about the same size as the rest, which are themselves subequal; the two lateral (*L.L.*, *R.L.*) lobes are separated by a deep sulcus from the two central lobes (*L.C.*, *R.C.*); the



Liver of *Hapalemur griseus*.

umbilical fissure (*g*) extends only about halfway from the free to the attached border of the liver, and the right and left central lobes are almost fused into a single lobe. The Spigelian lobe (*S.p.*) is large and almost quadrangular in shape; the caudate lobe (*ca*) is well developed, and free for three fourths of its extent from the right lateral.

Viewed from the upper (diaphragmatic) surface the umbilical fissure appears as a notch barely half an inch in length; the cystic notch is conspicuous, and partially separates off a cystic lobe which is about one third of the size of the right central. The gall-bladder (*g.b.*) is large and lies in the cystic fissure; as in *Lemur* the cystic duct arises from that end of the gall-bladder which is turned towards the free edge of the liver; the fundus of the gall-bladder lies towards the attached border of the liver, the normal position of the organ being therefore reversed; the cystic duct is much contorted at its commencement.

This curious position of the gall-bladder is stated by Prof. Flower<sup>2</sup>

<sup>1</sup> Huxley, P. Z. S. 1864, p. 29 (fig. 9).

<sup>2</sup> "Lectures on Comparative Anatomy of the Organs of Digestion of the Mammalia," *Med. Times and Gazette*, 1872.

to be "characteristic of all the species of the genus *Lemur* which have been examined, as well as *Microcebus*." It does not, however, exist in all the species of the genus *Lemur*: I have a sketch made by the late Mr. Forbes of the liver of *Lemur mayottensis* in which the extremely elongated gall-bladder has the normal characters, the fundus being turned *away* from the attached surface of the liver. I have (for my own satisfaction) examined the liver of this animal, and can entirely confirm the accuracy of Mr. Forbes's observation.

The *spleen* is very similar in shape to that of the Aye-Aye; it is trihedral in form, the two portions of which it is composed being inclined at right angles; they are subequal in size, the larger measuring  $1\frac{1}{2}$  inch in length.

*Respiratory System.*—The thyroid cartilage of the larynx is keeled on its anterior surface; at about the middle this keel is interrupted, and at this spot is a circular perforation which communicates with the interior of the larynx.

In the Potto and other Lemurs the thyroid cartilage is similarly keeled, but there is no perforation.

The *lungs* consist of three lobes on the left side and two on the right side; of these the lower larger lobe is partially subdivided into two; there is a small unpaired median lobe.

The *aorta*, as in many other Lemurs, gives off a right innominate artery, from which both carotids and the right subclavian take their origin, while the left subclavian arises separately from the aortic trunk.

The *chief arteries* of the limbs form *retia mirabilia*.

The *kidneys* present no differences from those of other Lemurs; the right is situated rather nearer to the diaphragm than the left; each kidney has a single papilla.

The *supra-renal bodies* are long and oval, and situated in front of and to the inside of the kidneys.

*Generative Organs.*—The generative organs closely resemble those of *Lemur*.

There are two large vesiculæ seminales, which lie close together behind the bladder; the upper extremity of each is bent inwards and downwards, and its cavity is partially separated off by a strong fold; the internal surface of the vesiculæ seminales has a reticulated appearance, the lining membrane being raised into numerous folds which anastomose with each other; below the vesiculæ seminales are the prostates, which are compact glands sessile upon the wall of the urethra, divided into three pairs of more or less separate glands by deep furrows upon the outer surface.

There are two large oval Cowper's glands situated further down, and opening into the urogenital canal about  $\frac{3}{4}$  inch below the aperture of the prostates: these glands are greenish in colour like the rectum, to which they are closely attached by membrane; each measures rather more than  $\frac{1}{2}$  an inch in length.

On slitting open the urogenital canal, an oval eminence is to be seen on the ventral surface; the posterior extremity of this colliculus seminalis is continued for some way down as a delicate fold, differing

in appearance from the surrounding mucous membrane of the urogenital canal. On either side of the colliculus seminalis and somewhat beneath is a comparatively large oval aperture, which appears to be single, and communicates with the vas deferens and vesicula seminalis of its own side. By passing a fine bristle down the vas deferens from above, it was ascertained that the latter in reality is distinct from the duct of the vesicula seminalis, and runs along its inner wall as a fine tube, the external orifice being placed to the inside of that of the vesicula seminalis and only separated from it by the thickness of its own wall.

In the majority of Lemurs the vas deferens opens separately from the vesicula seminalis and to the inside of it. In *Lemur catta* the orifices of both are situated on the upper surface of the colliculus seminalis; the vas deferens opens on to a small tongue-shaped process, which projects into the inner side of the crescentic aperture of the vesicula seminalis which nearly surrounds it. In *Loris gracilis*, *Nycticebus tardigradus*, and *Perodicticus* the orifices of the vasa deferentia and vesiculæ seminales, although very close together, open separately. Prof. Huxley states of *Arctocebus*:—"The vasa deferentia terminate in the urethra by two apertures placed close together, upon the end, or rather the under surface, of a papilla-like colliculus seminalis, which is slightly bifid at its extremity. At first I took the notch which causes this appearance for the mouth of an uterus masculinus, which I imagined might lie on the elevated ridge which extends between the apertures of the vasa deferentia and those of the ureters; but careful examination did not reveal the existence of any such structure. Two longitudinal folds of mucous membrane, along which the apertures of the prostatic ducts are situated, extend from the colliculus and form the lateral boundaries of a wide fossa, which it overhangs. This fossa receives at its upper and back part the ducts of two large oval sacs, which are perfectly distinct from one another, though their inner walls are united for some distance. The walls of these sacs are raised into oblique folds, and they lie at the back of the neck of the bladder behind the vasa deferentia, and occupy the place of the vesiculæ seminales. As they do not communicate directly with the vasa deferentia, however, I am doubtful whether they ought to be considered as representing the vesiculæ seminales, or as a large uterus masculinus."

In *Avahis laniger*, Milne-Edwards figures and describes the vesiculæ seminales as opening a long way behind the vasa deferentia; while in *Propithecus* the same author states that the vesicula seminalis opens, together with the vas deferens of its own side, by a common aperture.

There is therefore a considerable difference in different Lemurs between the relative positions of the apertures of the vesiculæ seminales and vasa deferentia. *Avahis laniger* is at one extreme of the series and *Arctocebus* at the other; in this latter genus the disappearance of the posterior portion of the colliculus seminalis has caused the apertures of the vesiculæ seminales to unite *below* the apertures of the vasa deferentia. In all other species that I have





J. Smith lith.

HYBRID BOVINES.

Hazburt imp.



P. Z. S. 1884. Pl. XXXV.



J. Smit lith.

Hanhart imp.

HYBRID BOVINE.

examined the colliculus seminalis is complete posteriorly and attached to the wall of the urogenital canal for the whole of its length; on either side of this is the crescentic aperture of the vesicula seminalis, which lies to the outside of the small aperture of the vas deferens or unites with it (*Propithecus*). *Hapalemur griseus* appears to occupy an intermediate position between *Lemur* on the one hand and *Propithecus* on the other, since the aperture of the vas deferens, though distinct from that of the vesicula seminalis, is enclosed within the same area.

The structure of the vesiculæ seminales in *Hapalemur* is exactly like that of *Lemur catta*; while in *Perodicticus*, *Loris gracilis*, and *Nycticebus tardigradus* the vesiculæ seminales are stout, pyriform sacs with thick walls raised internally into longitudinal ridges, of which two are especially stout and thick; these are united by a network of smaller ridges; the distal end is not bent inwards and partially constricted off as in *Hapalemur* and *Lemur*. In all these points *Arctocebus* appears to resemble *Nycticebus* &c.

The penis of *Hapalemur griseus*, as in other Lemurs, is furnished with a bone; the glans penis is rough and tubercular, being covered with numerous small plates, some of which bear short, recurved spines, which are longer upon the hinder part of the glans; the anterior end of the glans penis is smooth and grooved upon its lower surface to correspond with the bifid extremity of the os penis; the urethra opens at the posterior extremity of this groove.

*Postscript added June 21st.*—I am now able to state that the patch of spine-like processes upon the arm is not a sexual character, but is found in both sexes of *Hapalemur griseus*, while it is unrepresented in *Hapalemur sinus*; I applied for information on this point to Dr. Jentink and to Prof. A. Milne-Edwards; these gentlemen very kindly examined the large series of examples of the two species preserved in the Museums of Leyden and Paris, and informed me that *Hapalemur griseus* is distinguished from *H. sinus* by a patch of spines upon the arms, which, however, show certain differences in the two sexes: in the male they are as described above (p. 393); in the female the spines are replaced by hairs, but the patch as a whole is quite distinct from the rest of the integument of the arm. Dr. Jentink furthermore directed my attention to a possibly similar structure (a climbing organ?) upon the arm of *Lemur catta*, which has the form of a horny outgrowth somewhat like the spur of a cock.

## 2. On some Hybrid Bovine Animals bred in the Society's Gardens. By A. D. BARTLETT, Superintendent.

[Received June 3, 1884.]

(Plates XXXIV. & XXXV.)

The subject to which I have the pleasure of calling your attention this evening is the production of some remarkable Bovine animals in the Society's Gardens.

I will endeavour, by the aid of the pedigree before you, to explain the order or manner in which they were produced.

# PEDIGREE OF HYBRID BOVINES.

Zebu ♂ — Gayal ♀.

A. Female Hybrid (Zebu × Gayal) — Bison.

Born Oct. 29, 1868.

B. Female Hybrid ..... (Zebu × Gayal × Bison) — Bison.

Born May 21, 1881.

C. Female Hybrid ..... (Zebu × Gayal × Bison × Bison).

Born March 12, 1884.

In the first place, the bull Zebu (*Bos indicus*) was introduced to the cow Gayal (*Bibos frontalis*), and a female hybrid was born Oct. 29, 1868 (A of pedigree). This animal (A) produced her first calf June 16, 1872, a second one Oct. 16, 1873, a third one Jan. 5, 1875, a fourth March 11, 1876, a fifth Nov. 2, 1878; these five calves were the produce of this female hybrid Gayal with the Zebu bull. She was now introduced to the male American Bison (*Bison americanus*), and on the 21st of May 1881 she produced a female No. 2 (B of pedigree).

It will be seen that this animal (B) is the produce not only by the intermixture of three well-marked species, but, according to our present definition, of three distinct genera.

This remarkable animal, the result of the triple alliance (Plate XXXIV.), was last year introduced to the bull Bison, and on the 12th of March, 1884, she produced a female (C of pedigree). This last individual, now eleven weeks old (Plate XXXV.), is undistinguishable from a pure-bred Bison of the same age.

Having placed before you the facts of the wonderful fertility of this hybrid race, and the remarkable display of what I think may be called the plastic properties that are capable of producing by artificial selection a variety of races, I think I may venture to say that the hybrid Gayal and Zebu would have bred with any true bovine animal.

For many years I have carefully considered the subject of hybrid animals, having a strong suspicion that some of our domestic animals (for the origin of which our most able observers fail to fully account)

have been produced by a mixture of species. And in support of this opinion I will call your attention to some of the species of the Equine and Asinine group of animals. And I shall endeavour to show some very remarkable points to be found in confirmation of my ideas upon this subject.

During my visit to Norway I was much interested in noticing the multitudes of ponies in that country. By far the greater portion of them were dun-coloured, varying from dark dun to a pale cream-colour; but the most striking peculiarity was the striped or zebra-marked legs, together with *one* or *two*, and sometimes *three*, *shoulder-stripes*; most of them had also the dark medial line running from the mane down the back, ending in the tail.

These characters appear frequently among individuals of the common Domestic Ass, and also among Mules, the produce of the Horse and Ass.

The former Earl of Derby published in the 'Knowsley Menagerie' plates of several hybrid animals belonging to this family, the most remarkable one being of a double Mule that was born in the Gardens of this Society. This Mule had in its composition the *Zebra*, common *Ass*, and *Horse*. You will observe in the illustration now before you—and I can say from my own knowledge it is a most accurate representation of this animal—that the long hair commences from the base of the tail, like that of the Horse, whereas all the Zebras and Asses have the long hair at the extremity of their tails only.

My object in bringing forward this part of the subject is in the hope that it may induce experiments to be made that will lead to some important and useful discoveries. Having such positive proof of the fertility of some hybrids, I feel anxious that the old superstition should be entirely removed. The belief, so general, that all hybrids or mules are barren and useless for breeding-purposes is simply a stupid and ignorant prejudice, and has been the means, in my opinion, of preventing many valuable discoveries.

The late Mr. Darwin in his 'Origin of Species' calls particular attention to the Zebra-like markings observable in a number of animals of the Equine and Asinine family, and it appears to me to be highly probable that the Horse was originally produced by the mixture of species, seeing the unlimited variation in *size*, *colour*, *form*, and *marking*, and bearing in mind that no wild animal has been discovered that fairly represents the Horse.

The zebra-markings, so common among the very ancient stock of ponies in Norway, seem to indicate their remote origin to be connected with a striped animal, the traces of which are still visible.

I had intended to extend these remarks, and to have added a list of the hybrids that are known to be fertile, but finding that there are some valuable experiments now being carried out by Mr. Day and others, in the hope of producing a non-migratory Salmon, by the mixture of other species of the Salmonidæ, I have deferred doing so in order to make the list more complete.

## EXPLANATION OF THE PLATES.

## PLATE XXXIV.

- Fig. 1. Female hybrid bovine, B. Born May 21, 1881.  
 2. Female hybrid bovine, C. Born March 12, 1884; one month old.  
 (Drawn April 14, 1884.)

## PLATE XXXV.

- Fig. 1. Female hybrid bovine, C. Born March 12, 1884; eleven weeks old  
 (Drawn June 1, 1884.)

3. On the Unimportance of the Presence or Absence of the Hallux as a Generic Character in Mammalogy, as shown by the gradual Disappearance of this Digit within the limits of a single Genus. By G. E. DOBSON, M.A., F.R.S.

[Received May 29, 1884.]

The presence or absence of the hallux has been so often considered by mammalogists as sufficient ground for the formation of a new genus, that any instances in which it can be shown that this digit may disappear within the limits of a single genus, the species of which are united by indissoluble bonds of common affinity, is of much interest and importance.

Of all the genera of Placental Mammals few exhibit such close affinities among the species composing them as *Erinaceus*, which may be taken as an example of a thoroughly natural genus incapable of division into subgenera or well-marked subdivisions of any kind. Nevertheless this genus has been divided, one species, *E. albiventris*, having formed the type not only of a new subgenus (*Atelerix*, Pomel), but even of a new genus (*Peroëchinus*, Fitzinger).

Although, as already pointed out in my 'Monograph of the Insectivora',<sup>1</sup> I have long considered the absence of the hallux in *E. albiventris* of little importance, seeing that that digit presents all degrees of development in the other species, from its comparatively large size in *E. europæus* down to its rudimentary condition in *E. diadematus*, where it is only 4 mm. in length, yet, up to the time of writing this note, I was unable to find any examples in which the extent of development of this digit might be said to be truly intermediate between its condition in *E. diadematus* and *E. albiventris*. Lately, however, in a collection kindly made for me at Lagos by the Colonial Surgeon, Dr. J. W. Rowland, I found specimens of *E. albiventris* (well preserved in alcohol), which furnish all the material required.

The specimens referred to consist of examples of an adult female, in which the second upper premolars of both sides have already been

<sup>1</sup> 'A Monograph of the Insectivora, Systematic and Anatomical,' pt. i. p. 11 (1882).

shed, and a young female, a few months old, in which these teeth are well developed, although the canines have but partially descended. The adult female differs from other adult specimens of *E. albiventris* in possessing, in the left hind foot, a minute hallux represented (external to the integument) by the presence of its claw only, although in the right hind foot there is no trace of this digit externally. On the other hand, in the young female above referred to, both hind feet possess a minute hallux, which, on dissection, I find consists of the usual number of phalanges, and, although there appears to be no trace remaining of *flexores breves* muscles, yet there is a distinct flexor tendon given off to the terminal phalanx by the *flexor digitorum fibularis* (*flexor hallucis longus*), and an extensor by the *extensor hallucis longus*.

On carefully re-flecting the integument from the sole of the right foot of the adult female, I find that, while the tendons of these muscles are still represented, the phalanges of the hallux have quite disappeared, the metatarsal bone alone remaining, having its distal extremity connected with the under surface of the integument by ligamentous structures only, to which the tendon of the *extensor hallucis longus* is still attached on one side, and the very rudimentary, fascia-like slip, representing the remains of the tendon from the *flexor digitorum fibularis* (*flexor hallucis longus*)<sup>1</sup>, on the other.

Here, then, we have a digit which appears to have undergone degeneration during the life of the animal, for it is reasonable to suppose that this female when young was provided with a hallux in each hind foot, like the young one in the same collection, and, as we find complete absence of this digit in both hind feet of other specimens of this species<sup>2</sup>, we are led to believe that either they possessed halluces when young and subsequently lost them, or that we have in the specimens above described examples of a local variety<sup>3</sup> of the same species in which these digits are still persistent, though in a very rudimentary state, and that the loss of that described was due to some accident. In either case, however, we have here an interesting demonstration of the progressive disappearance of the hallux within a single genus.

<sup>1</sup> For explanation of the use of these terms for the long flexor muscle of the foot in *Erinaceus*, see my paper "On the Homologies of the Long Flexor Muscles of the Feet of Mammalia" in Journ. Anat. Phys. vol. xvii. pp. 146-148.

<sup>2</sup> The hallux is altogether wanting, as determined by me by dissection; there is not even a trace of the metacarpal bone of this digit remaining in either of the hind feet of the specimens examined.

<sup>3</sup> It is interesting to note that, in these two *Lagos* specimens of *E. albiventris*, a small black streak is found on the white fur of the face between the eyes and on each cheek, representing the large similarly placed patches of dark-coloured fur on the face of *E. diadematus* as the rudimentary halluces represent the much more developed yet very small corresponding digits of that species, which, probably, still closely resembles the ancestral form from which both species were derived.

4. List of Coleoptera of the Families Carabidæ and Scarabæidæ collected by the late W. A. Forbes on the Lower Niger. By H. W. BATES, F.R.S.

[Received May 24, 1884.]

The following is a list of the Carabidæ and Scarabæidæ of which specimens were obtained by our much-lamented fellow-worker Mr. W. A. Forbes at various stations on the Lower Niger. Three species appear to be previously undescribed.

Family CARABIDÆ.

1. SIAGONA MANDIBULARIS, Guérin, Rev. Zool. 1838, p. 76.
2. SIAGONA FUSCIPES, Bonelli, Mém. Ac. Turin. 1838, p. 458.
3. SCARITES STRIATIDENS, Chaudoir, Bull. Mosc. 1855, i. p. 97.

Family SCARABÆIDÆ (LAMELLICORNIA).

4. TROCHALUS PILULA, Klug, Erman's Reise, Atlas, p. 36.
5. ANOMALA FLAVEOLA, Burmeister, Handb. Ent. iv. 1. p. 237.
6. ANOMALA FORBESI, n. sp.

*A. mixtæ affinis. Elongata, nigra; thorace et pygidio castaneo-fuscis, elytris fulvo-testaceis, femoribus rufo-testaceis; clypeo late quadrato conflunter punctato, angulis rotundatis, margine*

Fig. 1.



*Anomala forbesi.*

*sat acute reflexis, medio sinuato; thorace sparsim subtiliter punctulato; scutello nigro punctulato; elytris haud costatis, geminato striato-punctatis, interstitiis irregulariter punctatis, pygidio subruguloso haud profunde punctato.*

Long. 20 millim. ♂.

The exterior and longer claw of four anterior tarsi is bifid; terminal ventral segment strongly sinuated at the apex.

7. *ADORETUS CINERARIUS*, Burm. Handb. Ent. iv. 1. p. 476.

8. *ADORETUS RUGULOSUS*, Burm. Handb. Ent. iv. 1. p. 473.

9. *TEMNORHYNCHUS CRIBRATUS*, n. sp.

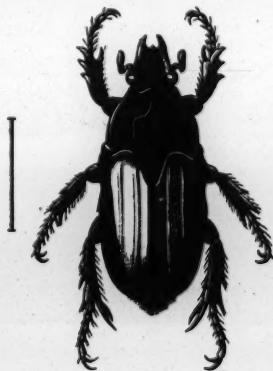
*T. retuso affinis; differt clypei lamina verticali multo altiori, apice angusta vix emarginata, thorace grossius et profundius subconfluenter punctato, antice fortius excavato-retuso, elytris punctulatis.*

Fig. 2.



*Temnorhynchus cribratus.*

Fig. 3.



*Gnathocera sericinitens.*

Long. 19 millim.

The middle of the upper margin of the anterior concavity of the thorax forms a thick rim.

10. *GNATHOCERA AFZELI*, Swartz, Schönh. Syn. Ins. i. 3. App. p. 50.

11. *GNATHOCERA SERICINITENS*, n. sp.

*Nigra, subtus nitida, supra sericeo-opaca; elytris (marginibus latis*

*suturaeque exceptis*) *fulvo-ochraceis, punctato-striatis, tricostratis; capite fere sicut in G. afzeli; thorace antice rectius angustato, medio dorso late sulcato. ♂ ventre medio vitta maculari ochraceo-tomentoso.*

Long. 17 millim. ♂ ♀.

PACHNODA MARGINATA, Drury, Ill. Ins. ii. p. 59, t. 32. f. 1; var. *aurata*, Voet, Col. i. t. i. f. 6.

5. Notes upon some Mammals recently discovered in Queensland. By CARL LUMHOLTZ, M.A. of the University of Christiania.

[Received June 3, 1884.]

During the three and a half years I travelled in Queensland I no doubt spent the most interesting part of my time in the ranges near Herbert River in North Queensland. By the kindness of Mr. W. Scott, I had my headquarters at Herbert Vale, a now deserted cattle-station on the Herbert River, at a very convenient distance from the ranges, to which I made excursions from this place, camping in the mountains in company with the blacks. Herbert Vale is, in a straight line, only about 15 miles from the coast. The nearest little town is Cardwell in Rockingham Bay. Herbert Vale is in 18° S. lat.; and the rainfall at Rockingham Bay is 90 inches.

The Great Dividing Range that runs along the east coast of the Australian continent, the Cordilleras of Australia, is in the southern part of Queensland low. In North Queensland it attains a greater elevation, in one spot even rising to a height of 5400 feet (Bellenden Kerr); and it is here, on account of the warm and moist climate, covered with fine tropical vegetation.

The range nearest the lower Herbert River, to the north of this, is between 2000 and 3000 feet high, and granitic. It is covered with dense shrubs; and numerous streams and rivulets hasten down the sides of the mountains to the bottom of the valley, often forming picturesque waterfalls. Here, in these extensive mountainous scrubs that commence near Herbert Vale, the new Marsupial mammals described by Dr. Robert Collett in his paper which was read at the last Meeting of this Society, are found. The scenery is very fine; but the character of the landscape is often wild, particularly near the crest of the mountains. It is difficult to penetrate into these regions. At one moment we find ourselves before steep precipices, the ground is rough and stony, but everywhere where there is the least possibility for any thing to take root, a variety of trees, often very large, have sprung up, while frequently creeping

and climbing plants spread themselves over the ground. Soon we come to a hilly and broken country, where the ground is more fertile; and here the vegetation is so dense that a man can only with the greatest difficulty work himself through it, torn to pieces by the so-called "lawyer palms" and stung by the nettles (*Laportea moroides*). The very troublesome "lawyer palms" are predominant in these mountainous scrubs, sometimes by their coils absolutely stopping the passage. But the variety of trees and plants otherwise is also very great. Those which near the top are most conspicuous by their beauty are the tree-ferns, that spread their magnificent fronds over the rivulets. Further down are bananas abundant, together with various kinds of palms. After passing across the summit of this range, one finds oneself again in a forest country, the eastern tongues of Leichhardt's great basaltic tableland. At the commencement of this tableland there are still low hills and valleys covered with somewhat similar scrubs, but they are not so dense, because the "lawyer palms" are rarer here.

The country I explored in the ten months I spent near Herbert River stretches from the lower Herbert, containing the (low) ridges on both sides of the river; but principally that hilly land between the Herbert River and Cardwell, from Herbert Vale northwards about 6 miles above Herbert-River waterfall. None of the new mammals go south of Dalrymple gap. *Phalangista lemuroides* and *Dendrolagus lumholtzi* are not found in the range south of Herbert River (sea-view range); and it is also very doubtful whether *Phalangista archeri* and *P. herbertensis* are to be found there.

1. *P. archeri*, called by the blacks Toollah (*suprà*, p. 381), is not uncommon in the upper part of these mountainous scrubs. It seems to be more commonly distributed than *P. herbertensis* and *P. lemuroides*, though it never goes far down the mountains. Besides being, like the Phalangiers, a night animal, it is in activity a great part of the day, as I have seen myself. The blacks kill it by climbing up the tree and throwing sticks at it, which often is very troublesome work. The animal is not very shy, but, when disturbed, it runs away quickly from tree to tree, so that a black man will sometimes have difficulty in killing it, if he has not got two or three of his comrades to meet it in different trees.

*Phalangista archeri* is the principal prey of *Dasyurus maculatus*, which is plentiful in the same country.

2. *Phalangista herbertensis* (*suprà*, p. 383), called by the blacks Mongan, is only found on the very highest tops of the ranges.

3. *Phalangista lemuroides* (*suprà*, p. 385), called by the blacks Yabby, is not found in that part of the range that lies east of Gowry Creek. It makes its appearance first at the spur of mountains between Gowry Creek and Herbert River, and is pretty plentiful from there northwards. I shot the only two specimens I got in one of the tableland scrubs. It is killed by the blacks in the same way as *P. archeri*.

4. *Dendrolagus lumholtzi* (*suprà*, p. 387), called by the blacks

**Boongary.** This animal lives on the highest parts of the mountainous scrubs, preferring the densest parts of the scrubs and the most inaccessible places, where even the blacks have to be careful amongst the rocks and stones. It is fairly well distributed along the crest of the mountains west and north-west of Cardwell. How far north it goes I do not know; I should think it would be plentiful a long way north of Herbert River, at least as far as Cooktown. In the above-mentioned patches of scrubs on the nearest tableland I found that the Boongary had once been plentiful, having left very numerous marks of their claws on the trees, but they had apparently been exterminated by the blacks, as the marks were old. Being of comparatively small extent and pretty easy to traverse, these scrubs offered the blacks an easy opportunity of getting their prey. The blacks told me that their old men had killed plenty of Boongary here. Possibly also the absence of *Dendrolagus* up here was partly due to migration. According to the blacks "Boongary plenty walks about;" and it is after my experience evident that these animals do move much about, mostly if they get disturbed. The blacks that followed me on my tours after *Dendrolagus* used always to say that Boongary was particularly active in moonlight. I believe that they also sometimes wander between these patches of scrubs on the tableland, having to pass over grass-lands. Once when we were travelling over to one of these scrubs, my blacks suddenly became excited and ran off after some animal that disappeared down a grassy hill. They soon found that they had made a mistake, but they all at first believed that it was a Boongary. This shows that the blacks are convinced that the animal is sometimes wandering in the grass-lands.

According to the blacks two or three are often found sleeping in the same tree. The Boongary is able to jump from a great height, and moves quickly on the ground. It seems to live only in one kind of tree. I have in any case only seen marks of its claws on one kind of tree, the name of which, I am sorry to say, I do not know. These trees are found very plentifully on the crest of the range, and grow often to a great height, always rather slender. In rainy weather the Boongary prefers the short, younger trees. It is often found at great distance from water, and the blacks used therefore to say that the Boongary never comes down to drink water. In the hot weather it is very much plagued by a large kind of horse-fly. The natives have told me that the Boongary often betrays its presence by the smack of its arms after the fly, which falls down dead. But it requires also the keen senses of a black to be able to notice this. At night it can also be heard, ascending the trees.

Although *Dendrolagus lumholtzi* is not uncommon in the mountainous scrubs, it is very difficult to find. First, because it likes the most inaccessible parts of these extensive scrubs, always near the top; secondly, because one cannot very well manage without the blacks, who however, besides being very treacherous, are a very lazy lot and are very difficult to induce to undertake such expeditions; finally,

because a good Dingo<sup>1</sup> is necessarily required for the sport, which is a very difficult thing to get, as each tribe keeps only one or two tame Dingoes and these they will not easily part with. It cost me three months' work before I got my first specimen. The flesh of the Boongary is greatly appreciated by the natives. It is very palatable; but this animal, like a great many other Marsupials, is infested by a worm between the muscles and the skin, which of course makes the flesh less inviting. The natives never think of hunting the Boongary without the help of a Dingo trained for this kind of sport. In the morning, while the Dogs still can smell the tracks of the animals, they start for the Boongary chase. All the while they speak in a peculiar characteristic manner to the Dog, thus: Cha<sup>2</sup>, Cha—Gangary pull-pulka—cha pull—Jingery dundun—Mormango—cha pull (here, here—smell Gangary—smell him—here smell, smell his feet—smart fellow—here smell). As soon as the Dog has found the tracks, it follows them, until it stops at the tree where the Boongary has gone up. One of the blacks climbs up the tree, and either seizes hold of the long tail of the animal with one hand, while with the other he smashes its head with a stick, or compels it to jump down, when it is killed by the Dingo.

June 17, 1884.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Mr. Henry Seebohm exhibited some skins of rare European and Asiatic birds, and made the following remarks:—

*Tetrao griseiventris*.—This is a new species of Hazel-Grouse from the forests of Tcherdyn between the sources of the Petchora and the Kama. It was described and figured as long ago as 1880 (Menzbier, Bull. Soc. Imp. Nat. Mosc. i. p. 105); and is an excellent species, nearly allied to the Common Hazel-Grouse, but perfectly distinct from it. Twenty or thirty examples have been obtained; but, so far as is known, none have ever found their way to England before.

*Tetrao mlokozievici*.—This is another example of an isolated species, being nearly allied to, but perfectly distinct from, the Common Black Grouse. It breeds in the pine-regions of the Caucasus, straying up to the rhododendron-regions to feed.

*Picus major pälzami*.—This is the Caucasian form of the Great Spotted Woodpecker. The West-European form of this species is intermediate between the Caucasian form, with chocolate-coloured underparts, and the Arctic form, with snow-white underparts.

*Haliaeetus pelagicus*.—This magnificent Eagle from Kamschatka is probably the largest Eagle known, and is remarkable for having 14 instead of 12 tail-feathers. Adult males with white shoulders are very rare in collections.

<sup>1</sup> These Dingoes are obtained by the natives when puppies, and are trained for Kangaroo and other hunting, but they seldom breed in confinement, and generally run away when they become old enough to breed.

<sup>2</sup> Cha cannot be translated literally.

*Eurynorhynchus pygmaeus*.—Two examples of this very rare Wader obtained at Yokohama are interesting.

---

Mr. Slater exhibited the deciduous knob of the culmen of the beak of the Rough-billed Pelican (*Pelecanus trachyrhynchus*), purchased July 3rd, 1883 (see P. Z. S. 1883, p. 463, pl. xlv.), which had been shed by the bird in the autumn, and called attention to the fact that, on coming into breeding-plumage again this summer, the bird had grown another knob, which it still carried, although the knob was no longer erect, but had turned over on the side.

This confirmed the observations of the American ornithologists on the same bird<sup>1</sup>.

---

Mr. Slater called attention to a very singular habit of one of the Greater Vasa Parrots (*Coracopsis vasa*), as observed in the Society's Gardens.

Two of these Parrots, believed to be a pair (one presented by Mrs. Moon, May 11, 1866, and the other by Mrs. King, March 29, 1882), had been for some time kept together in one large cage in the Parrot-house.

One of these birds, it was not known certainly which of the two, but believed to be the female, had the habit of producing from its cloaca a mass of dark flesh-coloured substance about 6 inches long and 4 inches in breadth, and of drawing it in again, after exposing it for several minutes.

This phenomenon had been witnessed on several occasions by the keeper of the Parrot-house, by Mr. Bartlett the Superintendent, who had kindly prepared a rough sketch of the object, by Mr. Clarence Bartlett, and others.

The bird appeared to be in perfect health; and the only suggestion Mr. Slater could make on the subject was that part of the membranous lining of the cloaca in this bird was capable of being blown out in periods of sexual excitement, like the bladder in the neck of the Adjutant (*Leptoptilus*), and the wattles in the neck of the Tragopans.

The Head-keeper, Benjamin Misselbrook, had stated that he recollected the same occurrence taking place in the case of a Greater Vasa Parrot in the Society's collection some thirty years ago.

---

The following papers were read :—

<sup>1</sup> Cf. Baird, *Ibis*, 1869, p. 350; Ridgw. Orn. 40th Parallel, p. 627 (1877); Goss, 'Rod and Gun,' June 12, 1875 (p. 167); Brewer, 'Rod and Gun,' June 19, 1875 (p. 194); Bendire, *Pr. Bost. Soc. N. H.* xix. p. 146 (last three references kindly furnished by Mr. Ridgway).—P. L. S.

1. On the Employment of the Remora by Native Fishermen on the East Coast of Africa. By FREDERIC HOLMWOOD, H.B.M. Consul Zanzibar.

[Received June 14, 1884.]

About two years since, whilst making a trip from Pemba to Zanzibar in a steam-launch, I noticed several small fishes darting from under the stern, when from time to time ashes, scraps of food, and other things were thrown overboard.

On examination I observed that these fishes had attached themselves to the sides of the boat quite regardless of the noise and disturbance of the water caused by the screw. On endeavouring to remove them I found that they were most determined in retaining their hold, but a native on board at once detached one from the planking by drawing it off sideways. It appeared to be a small Sucking-fish of about half a pound in weight; the native told me it was called "Chazo"; he evidently knew the fish perfectly well, but volunteered no information as to its being employed by the native fishermen.

Shortly after this, while driving in the country, I passed a native engaged in finishing off a small canoe which had been hewn from a fallen mango-tree. As it appeared too small to be of any practical use, I inquired for what purpose it was intended. He replied "for Chaza," and on further questioning him I could obtain no other answer.

"Chaza" being the native name for the oyster and other bivalves found along the shore, I imagined that the canoe was intended for skirting the coast in the shallow tideways whilst collecting shell-fish, which are here obtained in large quantities during spring-tides; but, never having seen a canoe of this kind in use, my curiosity was roused, and on returning home I asked a servant, who had been brought up in a fishing-village, in what district these small craft were employed. He told me they were used as "houses" for a fish called the "Chazo," and that most fishermen kept them in their huts. This brought to my recollection the small fish I had noticed during the recent voyage from Pemba, and led to my making further inquiries, in the course of which I learnt that the Sucker-fish was reared and trained by the native fishermen of Zanzibar for the purpose of catching Turtle, Tortoise, and the larger fish.

I had once before, when travelling in Madagascar, been told incidentally a story of Sharks and even Crocodiles being captured by the natives by means of a fish called "Tarundu," which was trained for the purpose; but at that time I was new to the country and had only an imperfect knowledge of the language, and no doubt also showed my incredulity so plainly that my informants refrained from again referring to the subject.

Now, however, I could see that there must be some truth in the story, and I determined to ascertain what the facts really were. With this object I visited the various fishing-villages along the coast, and found that every one knew of the use of the "Chazo," though they were not very communicative regarding it, nor did they invite me to enter their huts where I should have seen it. This was no doubt partly owing to suspicion, for these fishermen are an exclusive body, living mostly apart from the rest of the population, and, knowing that the English had just put an end to the time-honoured custom of slave-running, in which pursuit they had borne a considerable share, they possibly imagined we might have an intention of interfering with them in other ways.

Eventually I succeeded in allaying suspicion in one village, and was shown several of these fishes. They were in appearance something like a Conger Eel, with a smooth and apparently scaleless skin; they were without the dorsal fin, but had on the top of the head an oval laminated disk or sucker. They varied from 2 to 4½ feet in length, and in weight from two to seven or eight pounds.

They were mostly kept in small canoes similar to the one which had first attracted my attention, and at once came to the surface of the water on the approach of the fisherman, whom they allowed to take them from the water and handle them freely without attempting to plunge or break away. The owners called them with a soft whistling sound, but I had no means of observing whether this was recognized by the fish.

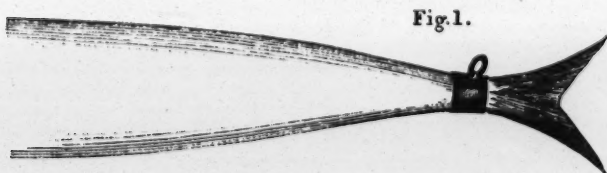


Fig. 1.



Fig. 2.

Fig. 1. Tail-end of Remora, with wrought-iron band and ring.

Fig. 2. Ditto, with ring fixed on by wire.

Each Chazo had a strong iron ring or loop fixed just above the tail (fig. 1) for the purpose of attaching a line to when being employed in

hunting. In some cases these appendages had evidently remained on for years, during which the fish had so grown that the iron had become imbedded in a thick fleshy formation. In two instances the ring had been inserted in the muscular substance at the root of the tail, but generally a simple iron band was welded round the thinnest part of the body a few inches from the tail, which kept it from slipping off. To this was riveted a small movable ring or loop resembling that of a watch-handle. In one case (fig. 2) this loop was fastened on by servings of brass wire in a similar manner to the rings of a fishing-rod.

It was some weeks before I succeeded in purchasing one of these fish; I proposed sending it to the International Fisheries Exhibition, but it was killed by some Cranes; and a second one which I obtained died, probably through want of sufficient water, it having been placed in a small stone tank, in consequence of my being unable to procure one of the small canoes.

I afterwards arranged to purchase another on its return from a fishing-trip. It was brought to me a few weeks later minus its ring, and with a large wound or rent above the tail, part of which was gone. The owner declared that it had caught two Turtle, which he showed me lying in his canoe, and that it had afterwards affixed itself to a large Shark and, holding on after all the spare line had been paid out, the tail had given way. He stated that the Chazo had then relinquished its hold and returned in its mutilated state to the boat. He assured me this was not an unusual occurrence, and that after a time a fresh ring would be attached and the fish become as useful as before. I endeavoured to preserve one of these Chazos in spirits of wine, but failed owing to the inferior quality of the spirit. This specimen measured 2 feet 8 inches in length and weighed  $3\frac{1}{2}$  lbs. The sucker contained twenty-three pairs of lamellæ.

I was anxious to visit the fishing-grounds in order personally to verify the information collected regarding the employment of this fish; but as the trips made by the fishermen never occupy less than fifteen days, my accompanying them was out of the question, and I had no boat sufficiently large to make the voyage safely.

On my return to Zanzibar, however, I hope to arrange such a visit, and may then be able to supplement this paper, which does not pretend to any scientific value, with a full and accurate report on the whole subject.

In the meantime this short account of what was recently heard and seen as to the use of the Remora on the east coast of Africa may perhaps prove useful by directing attention to an interesting zoological question.

2. Further Notes on Whitehead's Nuthatch. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received June 4, 1881.]

(Plate XXXVI.)

Mr. John Whitehead, to whom we are indebted for the discovery of this Corsican Nuthatch, which I have named after him, has sent me a specimen of the adult female, and I am thus enabled to give an exact description of the species, the adult male having been exhibited by me at a previous meeting of the Society (May 20).

*SITTA WHITEHEADI.* (Plate XXXVI.)

*Sitta whiteheadi*, Sharpe, anteà, pp. 233, 329.

*Adult male.* General colour above slaty blue, the lesser and median coverts like the back; the greater coverts blackish with light edgings of slaty blue; bastard-wing feathers blackish; primary-coverts and quills blackish brown, externally slaty blue, paler on the latter; the inner secondaries externally slaty blue; two centre tail-feathers slaty blue, the remainder black, the three outer feathers slaty blue at the tips, these terminal spots decreasing in extent across the inner web, where they terminate in a white edging, the outer web also narrowly fringed with white near the end; crown of head and occiput black, disappearing on the nape; a line of greyish white across the base of the forehead extending backwards in a broad eyebrow as far as the nape; feathers round the eye whitish; lores black, as well as a broad line along the upper edge of the ear-coverts, the latter slightly spotted with white where they adjoin the eye; remainder of ear-coverts, cheeks and throat dull white, the latter slightly washed with isabelline; under surface of body ashy isabelline; the under tail-coverts edged with white; sides of body and thighs somewhat washed with ashy; axillaries and under wing-coverts like the breast, the edge of the wing whiter. Total length 4·6 inches, culmen 0·65, wing 2·75, tail 1·4, tarsus 0·65.

*Adult female.* Differs from the male in having the head slaty blue like the back, the feathers of the crown slightly mottled with blackish bases; the dark streak through the eye not quite so pronounced as in the male, and more blackish brown. Total length 4·6 inches, culmen 0·65, wing 2·75, tail 1·45, tarsus 0·7.

The nearest allies of *Sitta whiteheadi* are undoubtedly *S. krueperi* and *S. villosa*. It resembles the first of these in its small size, but differs in having the entire crown and nape black in the male, instead of only the fore part of the crown, while both sexes are at once distinguished by the want of the chestnut band on the fore neck, which is the leading characteristic of *S. krueperi*.

To *S. villosa* and *S. canadensis*, the Corsican Nuthatch bears a



J G Keulemans lith.

Hanhart imp.

SITTA WHITEHEADI ♂ ET ♀.



J. G. Keulemans lith.

Hanhart inv.

SALPORNIS EMINI.

still greater resemblance in the black head and black streak through the eye, which are found in all three species; but *Sitta whiteheadi* is recognized at once by the ashy isabelline colour of the underparts, instead of the cinnamon-buff or fulvous colour of the lower surface in the Chinese and North-American birds.

### 3. On a new Species of *Salpornis* from Eastern Equatorial Africa. By Dr. G. HARTLAUB, F.M.Z.S.

[Received June 4, 1884.]

(Plate XXXVII.)

I have the pleasure of sending for the examination of the Zoological Society of London a specimen of a new Creeper of the genus *Salpornis*, which I propose to call

*SALPORNIS EMINI*, sp. n. (Plate XXXVII.)

*Supra in fundo fusco-nigricante, maculis apicalibus rotundatis albis vel albidis, antice nigro-marginatis pulchre et confertim guttulatæ; pileo fulvescente striolato; capitis lateribus fulco-pallidis; regione parotica obscure fusca; striola superciliari pallida parum conspicua; supracaudalibus maculis rotundatis majoribus albis; tectricibus alarum minoribus dorso concoloribus, majoribus ante apicem albidum late nigris; remigibus primariis in tertia parte apicali immaculatis, fuscis, cæterum maculis pogonii interni minoribus, marginalibus, albis, minus circumscriptis; primo eodem loco non maculato sed serratim albido marginato; tertiariis fuscis, in pogonio externo albido limbatis, latius nigro-fasciatis, interno notis marginalibus minus distinctis; subalaribus fasciatim maculatis; gula ochroleuca immaculata; pectore, abdomine et subcaudalibus fulvescenti-pallidis, maculis minutis rotundatis albidis, supra nigro-circumdatis conspicue guttulatæ; rectricibus irregulariter albido et fusco-nigricante fasciatis, fasciis latioribus fuscis, angustioribus albidis; rostro fusco, mandibula parte apicali excepta pallidiore; pedibus obscure fuscis. (Mas. ad.)*

Long. tot. circa 150 millim., culm. 21, alæ 95, caud. 58, tars. 14, pollic. c. ung. 19.

The Certhine genus *Salpornis*, established in 1847 by the late G. R. Gray, is a very rare and very restricted one. Up to the year 1878, the only species constituting it was an interesting Indian type—*Certhia spilonota* of Franklin, P. Z. S. 1831, p. 121. A second and quite typical species was discovered by the indefatigable Portuguese collector, M. T. d'Anchieta, near Caconda in the interior of the province of Benguela, S.W. Africa. Prof. Barboza du Bocage has described and figured this bird as a new generic type and

species under the name of *Hylopsornis salvadori*. *Salpornis spilonota*, being extremely scarce in continental collections, and, for instance, not existing in the splendid Museums of Paris, Leyden, Brussels, Vienna, Berlin, Dresden, and Stuttgart, had very probably remained entirely unknown to him, and for this reason the error into which he fell is to be excused. I have now the pleasure of introducing a third typical species, which was discovered near Langomeri, in Eastern Equatorial Africa, by the eminent explorer, Dr. Emin Bey, and of which the unique specimen, a fine adult male, enriches, at present, my private collection. As the life of my poor friend, who may still linger in his remote quarters on the Upper White Nile, is at this moment surrounded by the greatest possible dangers, and as no news whatever of him have of late reached us, I think it my duty to name this fine new bird after its discoverer.

Regarding this unique specimen, Dr. Emin Bey writes:—"During a walk through the ripe Eleusine-fields, a small bird met my attention climbing up and down the haulms, and flying in short whips from one haulm to another. What could it be? Not a *Nectarinia* to be sure. The little unknown was very silent. But how great was my pleasure and surprise as my shot brought down a '*Certhia*,' certainly the first bird of this group met with in Central Africa. All my efforts to procure more specimens were fruitless."

*Salpornis emini* and *Salpornis salvadorii* are nearly allied species. The system or the pattern of coloration is quite the same in both birds. The differences are these: the drop-like spots of the upper parts are much larger in *S. salvadorii* (of which a fine adult pair was presented to the Bremen Museum by Prof. Barboza du Bocage); the irregular bands of the rectrices are very broad and nearly black in *S. salvadorii*, narrower and browner in *S. emini*; the irregular white spot-like bands are also decidedly broader in *S. salvadorii*; in *S. emini* the first primary has the basal half of the inner web with a whitish serrated marginal lining, whereas in *S. salvadorii* there are regular circumscribed marginal spots; in the other primaries the whitish marginal spots on the basal half of the inner web are very conspicuous and sharply circumscribed in *S. salvadorii*—they are much smaller and more confluent in *S. emini*; the ground-colour of the remiges and rectrices is nearly black in *S. salvadorii*, paler and browner in *S. emini*; the drop-like spots of the underparts are much smaller and less distinct in *S. emini*. In both species the rounded terminal whitish spots of the single feathers are anteriorly margined by a broad black band or border. The ground-colour of the underparts is in both species a pale greyish drab.

The difference between *S. emini* and the Indian *S. spilonota* is much greater, and strikes one at first sight. The whitish spots of the upper parts are smaller, less drop-like, and of a more irregular shape. There is a short, broad, white superciliary stripe, bordered below by a blackish postocular band; and the underparts are conspicuously more banded than spotted. The internal marginal spots of the primaries are as sharply defined as in *S. salvadorii*.

I add the comparative measurements of the three species:—

	<i>S. spilonota.</i> millim.	<i>S. emini.</i> millim.	<i>S. salvadorii.</i> millim.
Culmen .....	23	21	18
Wing .....	88	93	93
Tail .....	58	58	58
Tarsus .....	14½	14	16½
Poll. c. ung. ....	19	19	22

The iris is brown in all three species.

I am much obliged to Capt. G. A. Shelley for the loan of a good specimen of *S. spilonota*, which it would have been impossible for me to procure from any continental collection known to me.

The synonymy of the three species of *Salpornis* is as follows:—

1. *S. SPILONOTA.*

*Salpornis spilonota*, Frankl. P. Z. S. 1831, p. 121; G. R. Gray, P. Z. S. 1847, p. 7; id. Gen. of B. i. p. 144; Reichb. N. S. pl. xxxviii.; id. Handb. d. Sp. Orn. Scans. pl. 564; Jerdon, B. of Ind. i. p. 382; id. Supplem. Notes &c., Ibis, 1872, p. 20; Gould, Birds of Asia, pt. xx., fig. bon.; Ball, Stray Feath. 1874, p. 397, 1876, p. 232, 1878, p. 209; Butler, Str. Feath. 1875, p. 462, 1876, p. 37, 1877, p. 228; Blyth, Cat. B. Mus. As. Soc. p. 338; id. Ibis, 1865, p. 48 (first good descript.), 1866, pp. 228, 365; Blanf. Ibis, 1867, p. 461; Adam, Stray Feath. pt. 5; Allan and Hume, Journ. As. Soc. of Beng. 1869, pt. ii.; id. ibid. 1870, pt. ii. p. 113; id. Ibis, 1871, p. 446, 1872, p. 20; Gadow, Cat. B. Brit. Mus. vol. viii. p. 330.

*Hab.* Widely distributed through the jungles of Central India: Chanda, Behar, Oude, Sironcha, Sambhur Lake, &c.

2. *S. SALVADORII.*

*Hylopsornis salvadori*, Barb. du Boc. Jorn. Acad. Lisb. 1878, pp. 198, 211; id. Ornith. d'Ang. p. 289, t. x. f. 2 (fig. bon.); Shelley, Ibis, 1882, p. 255; *Salpornis salvadorii*, Gadow, Cat. B. Brit. Mus. vol. viii. p. 330.

*Hab.* Benguela in S.W. Africa, "extending across through the Mashoona country into S.E. Africa."

3. *S. EMINI.*

*Hab.* Langomeri, Eastern Equatorial Africa (*Dr. Emin Bey*).

4. Note on the Names of two Genera of *Delphinidæ*. By  
WILLIAM HENRY FLOWER, LL.D., F.R.S., P.Z.S.

[Received June 10, 1884.]

In the Revision of the family *Delphinidæ*, published in the 'Proceedings' of the Society for 1883, pp. 466-513, I have adopted two generic terms, which, as has since been pointed out to me, are not tenable, being already in use for other forms. I hope, there-

fore, that this notice may be in time to prevent their more general adoption.

These are:—1. *Clymenia*, Gray, Synopsis of Whales and Dolphins p. 6 (1868), substituted for the earlier *Clymene* of the same author, P. Z. S. 1864, p. 237. There is, however, a well-known genus of extinct Cephalopods so named by Münster ('Beiträge zur Petrefactenkunde,' i. 1839). *Clymene* also was appropriated long before by Savi (Syst. Annel. 1817), for a genus of Vermes.

*Prodelphinus* of Gervais ('Ostéographie des Cétacés,' p. 604, 1880) must therefore be substituted for *Clymenia* as the generic appellation of the smaller, narrow-beaked Dolphins without lateral grooves on the bony palate.

2. *Globiceps*, proposed as a modification of Lesson's hybrid *Globicephala*, or *Globicephalus* as it is now commonly written, is already preoccupied, as a genus of Hemipterous insects, by Le Pelletier and Serville ('Encyclopédie Méthodique,' x. 1825). It will be necessary therefore to return to Lesson's name.

# 5. Description of a new Variety of *Lacerta viridis*, from South Portugal. By G. A. BOULENGER, F.Z.S.

[Received June 12, 1884.]

(Plate XXXVIII.)

During a recent journey in Portugal, Dr. H. Gadow collected several specimens of a highly interesting variety of *Lacerta viridis*, which he has kindly handed over to me for description. I have great pleasure in naming it

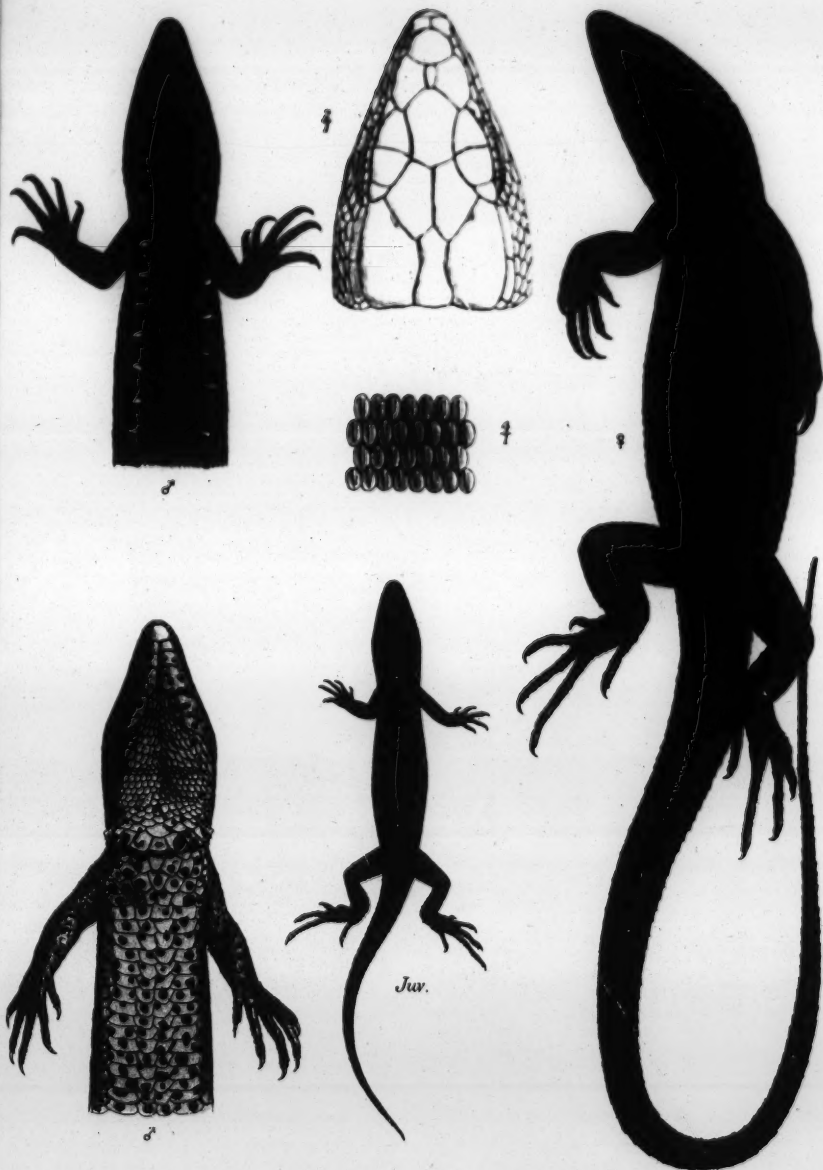
## LACERTA VIRIDIS, VAR. GADOVII.

A few years ago a wide gap seemed to exist between the two well-known species *L. viridis* and *L. ocellata*: the former with a very small occipital, large rhomboidal, strongly keeled dorsal scales, six or eight<sup>1</sup> longitudinal rows of ventral plates, the young longitudinally lined, &c.; the latter with enormous occipital, small granular smooth dorsal scales, eight or ten rows of ventral plates, the young ocellated &c. In 1878, however, Bedriaga<sup>2</sup> brought to light a new species nearly intermediate between the two long-known types, *L. schreiberi*, from the Province Asturias in N. Spain; this Lizard has a very large occipital, as in *L. ocellata*, and distinctly keeled dorsal scales, as in *L. viridis*. In 1880, Lataste<sup>3</sup>, turning his attention to the herpetological fauna of Algeria, showed that the *L. ocellata* of N.W. Africa was not identical with the European *L. ocellata*, as hitherto

<sup>1</sup> According to whether or not the outer, smaller, and more or less irregular, series is reckoned.

<sup>2</sup> Arch. f. Naturg. 1878, p. 299.

<sup>3</sup> 'Le Naturaliste,' 1880, p. 306.



R. Minton del et lith.

LACERTA VIRIDIS, VAR. GADOVII.

Minton Bros. Chromo. imp.



believed, but constituted a distinct form, intermediate between the latter and *L. viridis*, which he named *L. ocellata pater*. He showed that the occipital is smaller than in *L. ocellata*, the dorsal scales more oval, and sometimes slightly keeled, and the ocelli, which are constantly present in the young, frequently disappear in the adult. The discovery of these two forms had already considerably diminished the gap separating *L. ocellata* from *L. viridis*; but forms which would fill the interval remaining between the latter and *L. schreiberi* and *pater* were still missing. As one of these I regard the Lizard discovered by Dr. Gadow.

The general proportions and lepidosis being the same as in the typical *L. viridis* (from France and Italy), I will only mention the distinctive peculiarities, at the same time drawing attention to the points in which the new variety approaches the other allied forms.

The occipital is considerably larger, nearly as long as, and broader than, the interparietal; its shape is trapezoid, its smaller border forming a suture with the latter; in two specimens this suture has entirely disappeared and the two plates are united. Another anomaly, occurring in three out of the four specimens, is the presence of an azygos shield between the prefrontals. In the young, as in other Lizards, the interparietal is relatively much enlarged, especially transversely, so that it considerably exceeds in size, and equals in width, the occipital. We know that in the very young *L. ocellata* the interparietal exceeds in size the occipital, and nearly equals it in width, whereas in the adult the occipital is many times larger than the interparietal and at least three times as broad. In *L. pater*, when young, the interparietal also exceeds the occipital in size and is as broad or a little narrower; when adult, the occipital is much larger than the interparietal and twice as broad. In *L. schreiberi*, which, if adult, must be regarded as a form with arrested development, descended from *L. ocellata* or some close ally, the interparietal is very large, and the occipital short and only a little broader.

When a large series of *L. viridis* is examined, we find great variation in the size and shape of the occipital, so that the character just insisted upon cannot be regarded as constantly distinguishing the new form; however, it may be sufficient to distinguish it from the typical *L. viridis* as occurring in Spain.

The dorsal scales are a little different from those of *L. viridis*, being smaller, less distinctly rhomboidal, more oval, and not so strongly keeled, all points in which they approach those of *L. schreiberi*. I count 111 to 116 scales along the middle of the back, from the occipital to the base of the tail, and 50 to 53 across the middle of the body; in *L. viridis typus* I obtain the numbers 100 to 103 and 41 to 45. However, some Oriental specimens of *L. viridis* have also smaller scales, viz. 125 longitudinally and 50 transversely, but then they are of a different shape, being but a little longer than broad; and it is probable that the Oriental small-scaled *L. viridis*, when properly worked out, will prove to constitute a distinct race.

The coloration is quite peculiar, and suffices to distinguish this Lizard from any of its allies.

The young is above brownish-olive, the sides ornate with ocelli with large bluish-white centre and narrow black margin; there is an upper series of eleven ocelli, from the outer posterior corner of the parietal to above the hind limb; between this and the light under surfaces there is another series of ocelli, which, less regular and formed of the fusion of two ocelli, form short vertical bars. The upper lip is alternately barred black and white. The lower surfaces are of a pale greenish-white, without any of the spots which are so characteristic of the adult; but it must be borne in mind that in the young of *L. agilis* the spots are likewise absent or only very slightly indicated.

Now, if we compare this coloration with that of the young of the other species, we see at once that it differs most from *L. viridis*, the young of which has constantly light longitudinal lines on the body, which frequently persist in the adult female; the difference from the young of *L. pater* and *L. ocellata* is less, but still great, for in those forms the ocelli are much larger and scattered over the whole of the body; nearest we find *L. schreiberi*, which has a very similar arrangement of yellow spots along the sides of the body.

In the adult, the upper surface of the body and limbs is bright grass-green, sometimes fading to brown on the hind part of the body, with deep black spots, which may be larger and roundish, or smaller, closer, or with lighter centre resembling the markings of a Leopard; sometimes an unspotted zone along each side of the back; in the smaller male specimen, there is besides a series of small ocelli with pure white centres along each side of the back, the remains of the upper series of ocelli of the young. The upper surface of the head is olive, black-spotted, passing to blue on the sides, which latter colour covers the throat in the female as well as in the male. The belly is yellow, more or less greenish, with roundish black spots, more profusely scattered in the male than in the female. The tail is olive, darker above, with a median series of black spots, which are more or less confluent into a longitudinal band.

Four specimens were submitted to me by Dr. Gadow, who obtained them in the Serra de Monchique, Algarve, about 2000 feet above the sea, in sunny dense shrubs, amongst brambles near a little stream. The largest, a female, measures 278 millim., in which the tail enters for 192.

The only certain reference to this form I can find in the works of previous writers, is in O. Boettger's list of Reptiles collected by v. Maltzan in South Portugal<sup>1</sup>, where a short description is given from specimens likewise obtained in Monchique. Boettger gives it simply as *L. viridis*, remarking that it approaches nearest var. *punctata* of Dugès (this is evidently meant for var. *b.* of that author), which is, however, a totally different thing. But I should not be astonished that this new form remains concealed under the references of several authors to *L. viridis* and *L. agilis* in the south of the Pyre-

<sup>1</sup> Zeitschr. f. Ges. Naturw. lii. 1879: p. 505.

nean peninsula. And I am particularly inclined to believe that Schreiber's remarks on *L. agilis* from Granada<sup>1</sup> are based on specimens of *L. viridis*, var. *gadovii*. It is doubtful whether in the Peninsula the true *L. viridis* reaches south of 40°, and still more whether *L. agilis* occurs at all<sup>2</sup>.

## 6. Amphibiorum Italiæ enumeratio systematica.

Auctore doct. LAURENTIO CAMERANO<sup>3</sup>.

[Received June 11, 1884.]

Quæ amphibiorum species hic nonnisi suum quæque numerum ordine nanciscuntur, eas ipse iam singulas copiose descripseram in "Monografia degli Anfibi anuri Italiani" (Mem. R. Accad. d. Scienz. di Torino, ser. 2, vol. xxxv. 1883), "Monografia degli Anfibi urodeli Italiani" (ibidem 1884), quas vide, benigne lector, si tibi rem ipsam penitior persequi cognitione in animo sit.

In scriptis meis, quorum superius mentio est facta, fusius iamdudum disputabam quatenus Italiæ, quod attinet ad faunam, fines pertineant; et quas ipsa in provincias, habita ratione animalium, iure dividi possit.

Censeo equidem eam Alpibus a boreali parte, ab occidente vero irgis illis, quæ ab Alpibus maritimis decurrunt, et, postquam ab occasu vallem, quam vernaculo sermone Roia vocitant, circuerunt, ad mare usque perveniunt, non secus ac regni Italici fines: sursus ab oriente Sontio Valle terminatur, vel etiam, ne id ad vivum reseceam, Carro monte, usque ad urbem quam Fiume vocant, ut vernaculis utar nominibus. Reliqua denique Italiæ pars ipso mari undique finitur.

At, quamquam natura disiectæ, huc pertinent pleræque et potissime quæque insulæ videlicet Corsica, Sardinia, Ilva, Sicilia, Melita, exceptis tamen Pelagosa, Pantellaria, et Lampethusa.

Totam igitur Italiam, habita animalium ratione, in quatuor regiones dispartiri possumus, nempe *terram continentem, regionem intra peninsulæ fines, regionem Corso-Sardam, regionem Siculo-Melitensem.*

Sua cuiusque provinciæ Amphibia, quo magis perspicue et planius sese res habeat, in hoc *παράδειγμα* describam.

Omitto in hisce amphibiiis recensendis eas locorum demonstrationes, quæ adhuc dubiæ sunt.

Cum post editas "Monografia degli Anfibi anuri Italiani," e loc. citat., et "Monografia degli Anfibi urodeli Italiani," op. citat., nova ad me allata sint amphibiorum exemplaria e diversis Italiæ regionibus,

<sup>1</sup> 'Herpetologia Europæa,' p. 440.

<sup>2</sup> Cf. Bocca, "Catalogue des Reptiles et Amphibiens de la Péninsule Ibérique et des Iles Baléares," Bull. Soc. Zool. France, 1880, p. 240.

<sup>3</sup> Communicated by G. A. Boulenger, F.Z.S.

sua cuiusque loca demonstrandi cognitione certiore nunc mihi facultas est facta.

	Regio continentalis.	Regio peninsularis.	Regio Corso-Sarda.	Regio Siculo-Melitensis.
Ord. CAUDATA.				
<i>Spelerpes fuscus</i> (Bonap.) .....	.....	*	*	
<i>Salamandrina perspicillata</i> (Savi)...	.....	*		
<i>Euproctus rusconii</i> , Gené .....	.....	.....	*	
— <i>montanus</i> (Savi) .....	.....	.....	*	
<i>Triton vulgaris</i> , subsp. meridionalis (Bouleng.) .....	*	*		
— <i>alpestris</i> , Laur. ....	*	*		
— <i>cristatus</i> , subsp. karelinii, <i>Strauch</i> .....	*	*		
— —, subsp. longipes, <i>Strauch</i> . ....	.....	*		
<i>Salamandra maculosa</i> , Laur.....	*	*	*	*
— <i>atra</i> , Laur. ....	*			
Ord. ANURA.				
<i>Discoglossus pictus</i> , f. typ. Otth. ...	.....	.....	.....	*
— —, subsp. sardus, Gené ...	.....	.....	*	
<i>Bombinator igneus</i> (Laur.) .....	*	*		
<i>Pelobates fuscus</i> (Laur.) .....	*			
<i>Hyla arborea</i> , f. typ. (Linn.).....	*	*	.....	*
— —, subsp. savignyi, Aud. ...	.....	.....	*	
<i>Bufo viridis</i> , Laur. ....	*	*	*	*
— <i>vulgaris</i> , Laur. ....	*	*	*(1)	*
<i>Rana esculenta</i> , f. typ., Linn. ....	*	.....	*(2)	
— —, subsp. lessonae, Camer. .	*	*	.....	*
<i>Rana muta</i> , Laur. ....	*			
— <i>latastii</i> , Bouleng.....	*	*		
— <i>agilis</i> , Thomas. ....	*	*	.....	*

(1) Ins. Elba. (2) Corsica.

### Ord. CAUDATA.

#### Fam. SALAMANDRIDÆ.

#### Subfam. *Plethodontinæ*.

#### Gen. SPELERPES, Rafin.,

#### *S. FUSCUS* (Bonap.), Fauna Ital. (1837).

*Hab.* Liguria, Spezia, Apennini—Abetone, Garfagnana, Montecatini, Pratolino, Fiesole, Seravezza, Massa Carrara, Poretta, Monti Ascolani. Sardegna.

Subfam. *Salamandrinae*.Gen. *SALAMANDRINA*, Fitz.,

*S. PERSPICILLATA*, Savi, Mem. Bibl. Ital. vol. xxii. p. 228 (1821).

*Hab.* Apennini de Genovesato ad Aspromonte—Genova, Nervi, Lucca, Firenze, Caramanico, Pistoia, Garfagnana, Monte Laziale, Vesuvio, Tiriolo (Calabria), Aspromonte.

Gen. *EUPROCTUS*, Gené,

*E. MONTANUS* (Savi), Nuov. giorn. dei letterati, n. 102, Pisa (1839).

*Hab.* Corsica.

*E. RUSCONII*, Gené, Synops. Rept. Sard. indig., Mem. Ac. Sc. Torino, ser. ii. vol. i. p. 282 (1838).

*Hab.* Sardegna.

Gen. *TRITON*, Laurenti,

*T. VULGARIS* (Linn.), Fauna Suec. pp. 281 ; S. N. i. p. 370 (1766).

*T. vulgaris* (Linn.), subsp. *MERIDIONALIS*, Boulenger, Cat. Batr. Grad. Brit. Mus. p. 14 (1882).

*Hab.* Italia continentali et peninsulari.

*T. ALPESTRIS*, Laur. Syn. Rept. pp. 38, 142, tav. ii. fig. 4 (1768).

Spec. dimorpha.

1. Forma branchiata.

2. Forma abbranchiata.

*Hab.* Regione Alpina et Apenninica.

*T. CRISTATUS*, Laur. Syn. Rept. pp. 36, 146 (1768).

*T. cristatus*, Laur., subsp. *KARELINII*, Strauch, Revis. d. Salamandr. gatt., Mém. Acad. S. Pétersb. vii. ser. vol. xvi. no. 4, p. 42, tav. 1. fig. 1 (1870).

*Hab.* Italia continentali et peninsulari.

*T. CRISTATUS*, Laur., subsp. *LONGIPES*, Strauch, loc. citat. p. 44, tav. 1. fig. 2 (1870).

*Hab.* Gran Sasso d'Italia.

Gen. *SALAMANDRA*, Laur.,

*S. MACULOSA*, Laur. loc. cit. pp. 42 & 151 (1768).

*Hab.* Italia continentali et peninsulari. Sicilia ; Sardegna (?) ; Corsica.

*S. ATRA*, Laur. loc. cit. pp. 42 & 149. fig. 2 (1768).

*Hab.* Regione Alpina—Tirolo, Stiria, Friuli, Veneto, Bresciano, Valdieri, Monviso.

## Ord. ANURA.

## Subord. PHANEROGLOSSA.

Ser. *Arcifera*.

## Fam. DISCOGLOSSIDÆ.

## Gen. DISCOGLOSSUS, Otth.,

*D. PICTUS*, Otth. Neue Denkschr. allgem. Schweiz. Gesellsch. i. figs. 1-8 (1837).

*a. Forma typica.* Sicilia; Malta, Gozzo.

*a. Var. vittata.* Sicilia.

*β. Var. ocellata.* Sicilia.

*b. Subsp. sardus* (Gené, Rept. Sard., Mem. Ac. Sc. Tor. ser. ii. vol. i. p. 237, tav. v. 1838).

*Hab.* Sardegna; Corsica; Giglio; Montecristo.

## Gen. BOMBINATOR, Merr.,

*B. IGNEUS* (Laur.), Syn. Rept. pp. 29 & 129 (1768).

*Hab.* Canton Ticino, Veneto, Trentino, Emilia, Marche, Toscana, Napoletano, Calabria, Spezia.

## Fam. PELOBATIDÆ.

## Gen. PELOBATES, Wagl.,

*P. FUSCUS* (Laur.), Syn. Rept. pp. 28 & 122 (1768).

*Hab.* Rivoli, Torino, Testona, Settimo Torinese, Acqui, Vercelli, Quinto Vercellese, Nibbia (Novarese), Vigevano, Mirasole (Milano).

## Fam. HYLIDÆ.

## Gen. Hyla, Laur.,

*H. ARBOREA* (Linn.), S. N. i. p. 357 (1766).

*a. Forma typica.* Piemonte, Toscana.

*Var. intermedia.* Piemonte, Bologna, Palermo.

*b. Subsp. savignyi*, Aud. Corsica, Elba, Sardegna.

*Var. fuscomaculata.* Sardegna.

## Fam. BUFONIDÆ.

## Gen. BUFO, Laur.,

*B. VIRIDIS*, Laur. Syn. Rept. pp. 27 & 111, tav. 1 (1768).

*Hab.* tota Italia.

*a. Var. maculata.* Tota Italia.

*β. Var. crucigera* (*Bufo crucigera*, Eichw. Zool. sp. Ross. et Polon. p. 167, 3 γ.). Piemonte.

*γ. Var. lineata.* Piemonte, Veneto, Lombardia, Catania.

*δ. Var. concolor.* Piemonte.

*B. VULGARIS*, Laur. Syn. Rept. pp. 28 & 125 (1768).

*Hab.* Tota Italia peninsularis. Sicilia; Corsica (?); Elba.

## SCT. FIRMISTERIA.

## FAM. RANIDÆ.

## Gen. RANA, Linn.,

I. Sectio *Ranæ aquaticæ*.

RANA ESCULENTA, Linn. Syst. Nat. i. p. 357.

a. Forma *typica*. Torino, Domodossola, Bologna, Roma, Foligno.

b. Subsp. *lessonæ*, Camer. Valle padana; Toscana; Sicilia.

a. Var. *immaculata*. Piemonte, Novarese, Veneto.

β. Var. *maculata*. Novarese, Veneto.

γ. Var. *punctata*. Novarese, Veneto.

δ. Var. *nigrovittata*. Barbarighe (Veneto).

II. Sectio *Ranæ fuscæ*.

RANA MUTA, Laur. Synops. Rept. p. 30 (1768).

Var. *acutirostris*.

Var. *obtusirostris*.

*Hab.* Roccaforte, Casteldelfino, Moncenisio, Col. d. S. Giovanni (Viu), Ceres, Pra Sec du Ferret, Col. d'Ollen, Occhieppo inferiore, Alpi di Devero, Alpi di Veglia, Cascata della Frua, Passo della Colma (Ossola), Domodossola, Valle di Non (Trentino), Bardonecchia.

RANA LATASTII, Boulenger, Bull. Soc. Zool. Frang. (1880).

*Hab.* Milano, Varese, Veneto, Toscana.

RANA AGILIS, Thomas, Ann. Sc. Nat. 4 ser. vol. iv. p. 365, tab. 7 (1855).

*Hab.* Torino, Rivoli, Rosta, Testona, Rivarossa, Gattinara, Occhieppo inferiore, Milano, Varese, Canton Ticino, Padova, Verona, Venezia, Treviso, Belluno, Imola, Modena, Bologna, Pisa, Castinoen, Monte Morello, Porto Maurizio, Modica.

7. Remarks on a Paper by Dr. A. B. Meyer on a Collection of Birds from the East-Indian Archipelago, with special reference to those described by him from the Timor-Laut group of Islands. By H. O. FORBES, F.Z.S., F.R.G.S.

[Received June 12, 1884.]

Through Dr. Meyer's kindness I have had the pleasure of perusing his interesting paper, read at the International Ornithological Congress lately held in Vienna, entitled "Neue und ungenügend bekannte Vögel, Nester und Eier aus dem Ostindischen Archipel im Königl. Zoologischen Museum zu Dresden," and propose to offer a few remarks on those species which he notices from the Timor-Laut group of Islands.

The collection of birds on which Dr. Meyer founds his observations was made by three Amboinese in *identically the same* region as that from which the collection described by Dr. Sclater last year (P. Z. S. 1883, pp. 48 & 194) was sent by me. Two of these collectors arrived and departed in company with myself, and therefore spent three months there; the other had arrived three months in advance. Being there without any European superintendence, and surrounded by difficulties and dangers, they did not extend their excursions to any great distance from their dwelling in the village of Ritabel. My own limits were also circumscribed; but my area included and considerably exceeded all the region collected over by these three hunters, and was, of course, far more thoroughly investigated in every way. Inasmuch as I observe that Dr. Meyer in several instances speaks of "Timor-Laut" and "Tenimber," and that the species under consideration in his case came from the "südlichen (Timor-Laut) Stammen" of the region, those collected by me being inferred to come from some other part, it may be well to state that the term "Tenimber Islands" has been applied to the group of islands of which Yamdena (by the Malays called Timor-Laut) is the largest—lying between  $6^{\circ} 35' - 8^{\circ} 25'$  S. lat., and  $130^{\circ} 35' - 132^{\circ} 5'$  E. long. The distance separating the members of the group is so small (the sea at low-tide being in many cases quite shallow between them) that they may be considered almost one great island broken up into fragments. Latur, spoken of by Dr. Meyer as an island (on the authority of the Resident of Amboina), is part of the mainland of Yamdena.

Of the birds recorded by Dr. Meyer from Timor-Laut, eight are not included in Dr. Sclater's list; but of these the Accipitrine birds *Baza suberistata* (Gld.), and *Cuncuma* (*Haliaetus*) *leucogaster* (Gm.), were observed, though not obtained by me; *Urospizias albiventris* (Salv.), *Sauropatis sancta* (V. & H.), and *Eurystomus pacificus* (Lath.) I did not see. There may possibly be some doubt as to the occurrence of the last-named in Timor-Laut. I saw the Amboinese hunters shoot and prepare, on their way home to Amboina, during our stay both in Aru and Ké, several birds and add them to their Timor-Laut collections. What the species were I cannot now remember. As the best of natives cannot be trusted to label skins correctly without supervision, this fact adds a slight element of uncertainty as to the locality of some of the specimens. I obtained spirit-specimens of a *Hirundo* (young), probably *H. javanica*. I examined, but could not preserve, a specimen of *Porphyrio melanopterus*. The two sea-birds mentioned by Dr. Meyer, and the *Geocichla machiki* (P. Z. S. 1883, p. 588) complete the list of birds at present known from this interesting group. With the exception of those just mentioned, Dr. Meyer has had before him no species of which there is not a large series of specimens represented in my collection—those, in fact, on which Dr. Sclater's original descriptions were founded. I have now again carefully gone over them with Dr. Meyer's paper in my hand.

The *Geoffroius* determined by Dr. Sclater to be *G. keyensis* (Salv.)

is elevated into a new species, *G. timorlaornsis* (Meyer). Dr. Meyer admits that the separation is based on very minute differences<sup>1</sup>, which, however, he believes will be found constant. On comparing the Timor-Laut birds with Ké specimens in the British Museum determined by Count Salvadori, the case stands as follows:—Timor-Laut skins vary from 240–290 millim., while *G. keyensis* (Salv.) ranges from 235–255 millim. Length of wing in the former 165–170 millim., and in *G. keyensis* (Salv.) 175–185 millim. The tail is shorter in *G. timorlaornsis* than in *G. keyensis*; while the tarsus agrees in both. In Timor-Laut specimens the external web of the outermost primary, where in the upper portion the colour is blue, and in the lower green, exactly agrees with a specimen from Ké, of the 'Challenger' collection, determined as *G. keyensis* by Salvadori. Both these are males. A female from Ké has the same region of this feather blue throughout its length; while a female from Timor-Laut has a very narrow yellowish edge to the green-blue margin of the primary. A female, of the 'Challenger' naturalists, also determined by Salvadori as *G. keyensis*, is identical in coloration; while, lastly, the colour of the under surfaces of the wings can scarcely be detected to differ. It would appear therefore, so far as the skins from Timor-Laut and Ké, in the British Museum and in my own collection, afford material for forming an opinion, that these differential characters will not be found to have the constancy that Dr. Meyer expected. The wing measurements certainly are less in Timor-Laut specimens. It is probable that the differences in coloration are due to age only, and are not sufficient to separate the Ké from the Tenimber bird.

*Artamus muschenbroeki*, Meyer, is the name proposed for the Timor-Laut Wood-Swallow, which had been determined by Dr. Selater as *A. leucogaster* (Val.) (P. Z. S. 1883, pp. 51 & 200). Of the *Artamus* from Dr. Meyer's identical locality I have in my own collection three specimens. I have examined carefully seventeen others from different localities, in the very long series in the British Museum derived from *Celebes*, the *Philippines*, *Sumatra*, *Javā*, *Lombok*, *Flores*, *Timor*, *Batjan*, *Buru*, *Halmaheira*, *Goram*, *Aru*, *Batanta*, and from *N. Australia*. The species in the Dresden Museum from the underlined localities are admitted by Dr. Meyer to belong to *A. leucogaster*. It is impossible to separate my Timor-Laut skins from specimens collected in Zebu by the 'Challenger' Expedition, and determined by Lord Tweeddale (P. Z. S. 1877, pp. 544–545). The colour in both is absolutely the same. Lord Tweeddale, however, remarks on the difference of dress—"one in which the upper plumage is of a light bluish and cinereous colour, the other where it is of a more smoky brown and bluish ash. This does not seem to depend on sex; for one of these examples (Zebu 369) is marked ♂, while I possess a Luzon example exactly similar, which Dr. Meyer determined to be a ♀. The other Zebu example (No. 370) is marked ♀, and is in

<sup>1</sup> "*Geoffroius [timorlaornsis]*, *G. keyensi*, Sal., *simillimus*, sed minor et primariæ extimæ pogonio externo virescenti diversus."



the paler bluish-grey attire." I feel satisfied, after examining the specimens in the British Museum and in my own collection, that the difference in coloration is one due to age, for in young birds the plumage is lighter than in the adult state. Dr. Meyer's observation that the dark mantle reaches, in Timor-Laut skins only, just to the root of the tail, while in *A. leucogaster* it overlaps by about 1 centimetre, is, in as far as the series referred to enables an opinion to be formed, one not sufficiently constant to support specific separation. In several Timor-Laut specimens examined the dark plumage overlaps the tail more than 1 centimetre, and even more than in others from different parts of the Archipelago which have been hitherto recognized as *A. leucogaster*. In skins of *A. leucogaster* from Mysol and Macassar, the mantle is just conterminous with the root of the tail. Really, however, the absolute constancy of these measurements can be determined only with accuracy in the flesh, for the way in which the skin is manipulated will increase or diminish them by several centimetres. The same holds with regard to another character given as differential—the greater amount, in Timor-Laut specimens, of white on the rump and upper tail-coverts. In my own specimens the white on the rump varies from 22–31 millim. in length, while in eight other skins from different regions of the Archipelago the range is from 26–32 millim., giving in the latter, indeed, a wider zone than in those from Timor-Laut. In the long series of British-Museum skins, the *white tips of all but the two middle tail-feathers*, another of Dr. Meyer's differential characters, is also quite inconstant. In several Timor-Laut skins not only these two tail-feathers, but several others of the remiges, are without a white band, while in some examples it is even less than in undisputed *A. leucogaster*. In *young* birds the white tips are very pronounced, not on the remiges only, but on the primaries and secondaries of the wing also. The Philippine (Zebu) birds, already referred to, have the tips of the remiges quite as broad as in those from Timor-Laut. In a Lombock specimen ("ex Stevens") the tips of *all* the feathers are white; a Batanta and a New-Holland specimen have no white tips at all; one from Halmahera and one from Buru (both from Mr. Wallace's collection), except in one feather, have no white on the remiges; yet all of them have been determined to be, and are undoubtedly *A. leucogaster* (Val.).

As to the species of *Pachycephala* (*arctitorquis*, Sclater) from Timor-Laut, we have the curious fact that, notwithstanding my more thorough examination of a wider field, the whole series obtained by me contained, if Dr. Meyer is correct in his determinations, no *females* of *P. arctitorquis* and no *males* of *P. riedelii* (were Dr. Meyer's specimens sexed?); while those who made the collection examined by Dr. Meyer obtained in Babbar (an island at no great distance to the W. of Yamdena) *females* of *P. arctitorquis*, and evidently no *males* (so recognized by Dr. Meyer), and females of *P. kibirensis* (Meyer), without one of its *males*. I daily saw the collections made in Timor-Laut by the Amboinese hunters above mentioned, and I feel confident that no species of

*Pachycephala*—one of the groups I am particularly interested in—was obtained by them which was not also in my collection. After comparing Dr. Meyer's descriptions with the long series I have of this bird, nearly all of which Dr. Selater had before him when writing his original description, and which contains birds in almost every stage of plumage, from the young bird to the fully adult, I have little hesitation in affirming that *P. arctitorquis*, ♀ (Meyer), from Timor-Laut and Babbar, is but the immature male, and *P. kebiensis* (Meyer) the nearly fully adult female of *P. arctitorquis*, in which the colour of the bill, when fully adult, is black; while *P. riedelii* is a still younger female of the same species. From this it would seem clear to me that *P. arctitorquis*, Scl., occurs in Babbar also, for the examples before Dr. Meyer from that island were young males and immature females, while from Timor-Laut he had adult males, immature males (♀, Meyer), and still younger females (*riedelii*, Meyer).

In describing a *Myzomela*, ♀, from Ceram, Dr. Meyer is in doubt as to whether it may not be the female of the species described by me as *M. wakoloensis* from Buru, without knowing the dimensions. As these are not given in the 9th vol. of the Cat. of Birds in the British Museum, I append them here. Total length 93 millim., wings 52·5–55, tail 35–38, tarsus 15, beak 12–13.

*Philemon timorlaoensis* is the name proposed by Dr. Meyer for the species designated *P. plumigenis* by Selater (P. Z. S. 1883, pp. 51 & 195). The Timor-Laut bird certainly differs from that from Ké, but the differences are scarcely to be formulated in words. The Tenimber bird seems intermediate between the Buru and Ké birds. Dr. Gadow, in the 9th vol. of the Cat. of Birds, has not separated the species, nor has Mr. Sharpe in the 16th part of Gould's 'Birds of New Guinea,' though he has expressed doubts as to their identity. Instead, however, of the rather ineuphonious cluster of vowels in the latter part of the new designation, may I suggest the more correct *timorlautensis*, inasmuch as *timorlao* is evidently a corruption of the word for "Sea-ward Timor"?

The species of *Calornis* from the Tenimber Islands has been distinguished from *C. metallica* as a new species, *C. circumscripta*. I have a large series of skins in my collection, and that they belong to a species distinct from *C. metallica* is undoubted, and, as Dr. Meyer observes, they can, when mixed up with any number of species of *Calornis*, be unhesitatingly picked out by the coloration of the throat. The throat-plumes in *C. metallica* are prominently longer and more mucronate than those in the Timor-Laut specimens. The violet of the mantle, however, contrary to the note of Dr. Meyer, has the blue-green reflexions observable in *C. metallica* quite distinct in most of my specimens, if the eye be "placed between the bird and the light" in position A, as described by Dr. Gadow (P. Z. S. 1882, p. 409), that is with "the eye and the light almost in a level with the planes to be examined." A species of *Calornis* discovered by Mr. Wallace in Mysol (of which the type is in the British Museum) was named *C. gularis* by G. R. Gray; but was considered by Count Salvadori

(the label bearing the name in his handwriting) as *C. metallica*, while it remained unique. After comparison of this skin with Timor-Laut specimens, the two are unquestionably identical. *C. circumscripta* (Meyer) must, therefore, be considered henceforth a synonym of *C. gularis*, G. R. Gr., which must now be removed from being a synonym of *C. metallica* to specific rank, confirming the opinion expressed in 1876 ('Ibis,' p. 46) by Mr. Bowdler Sharpe, who says:—"I must pronounce this, contrary to Lord Walden's opinion, a very good species, distinguished by its purple throat and small bill, the culmen only measuring .65 inch, as against .85 in *C. viridescens*." This measurement is not the only one by which the species can be distinguished, for the plumage in every specimen is so constant that the skins cannot easily be confounded with any other. *C. gularis* is slightly less, and more brightly metallic—a more beautiful bird, in my opinion, even than the true *C. metallica*; the purple of the throat, which is more chastely and delicately feathered than in *C. metallica*, is separated from the purple of the back and upper breast by a narrow and very bright green band. The total length of the bird in 14 specimens ranged from 210–250 millim. Count Salvadori (P. Z. S. 1878, p. 89) remarks:—"Some specimens (of *C. metallica*) have the throat more purplish than others, one from Mysol (*C. gularis*, Gray) cannot be separated from others from Halmaheira and Cape York." I have not seen any Halmaheira specimens; but the Cape-York bird undoubtedly differs by the purple on the breast, which is green in *C. gularis*; the green neck-band is much broader, and the throat is more markedly green and without purple. It has, I believe, been separated as *C. purpurascens*, Salv. The Admiralty-Island *Calornis* is somewhat similar to *C. gularis*, but is at once distinguishable by the absence of purple on the back; the head is purple; and it is known as *C. purpureiceps*.

The designation *Ptilopus flavovirescens* has been proposed by Dr. Meyer for the Timor-Laut Pigeon determined by Dr. Sclater as *P. xanthogaster* (Wagl.). The difference lies, he notes, in the "Gelbgrünlichgrau" of the head and neck. From a careful comparison of my own skins with those in the British Museum, I feel confident that the differences observed by Dr. Meyer will be found to be those due to age only. Very young birds have a grey band over the forehead, and the rest of the head with the neck and back nearly of the same shade of green; with advancing age we find every shade of green and yellowish-green to Dr. Meyer's "Gelbgrünlichgrau." The head of the fully adult bird is purplish grey, each feather having a pale yellow submarginal crescent across it.

Some of the skins obtained by me differ as to head and neck in no respect from specimens brought by Mr. Wallace from Banda; others have the head and neck of a grey colour tinged with every shade through green-blue to yellow, differing according to the age of the birds. I cannot detect in the specimens I have any difference in breadth of the "Gelb der Kehle" as compared with Mr. Wallace's specimens; nor is the *breast shield* constantly of one shade in all the specimens I have examined. In the Banda example (of Wallace) it

is darker than any Timor-Laut specimen before me. In agreement with all those in the British Museum, my Timor-Laut specimens have the outer margin of the primaries and secondaries as in Salvadori's description, "flavo-marginatis."

Dr. Meyer throws some doubt on a species of *Rhipidura* (*R. lenzi*, Blas.) having its true habitat in Celebes. He suggests that it is more likely to have been *bought only* in Menado. I am happy in being able to confirm his suspicion that its habitat is in the Moluccas. I obtained a specimen in Amboina, which is now deposited in the British Museum.

#### POSTSCRIPT.

It will be seen from the above remarks that no species not hitherto described, or of which specimens were not before Dr. Sclater when he wrote his paper on this subject in April last, has been brought to light by Dr. Meyer's collectors. So far as our present knowledge goes, the following is a complete list of the birds known to occur on the Tenimber Islands, embracing 69 species, of which 24 (marked \*) are peculiar to the group.

#### I. ACCIPITRES.

1. *ASTUR ALBIVENTRIS* (Salvad.).  
*Urospizias albiventris*, Salv., Meyer, op. sup. cit.
2. *HALIAETUS LEUCOGASTER* (Gm.).  
*Cuncuma leucogaster*, Gm., Meyer, op. sup. cit.
3. *HALIASTUR GIRRENERA* (V.).
4. *BAZA SUBCRISTATA*, Gould.
5. *PANDION LEUCOCEPHALUS*, Gould.
6. *CERCHNEIS MOLUCCENSIS* (H. & J.).  
*Tinnunculus moluccensis*, Sclater, P.Z. S. loc. sup. cit.
7. \**NINOX FORBESI*, Sclater.
8. \**STRIX SORORCULA*, Sclater.

#### II. PSITTACI.

9. \**TANYGNATHUS SUBAFFINIS*, Sclater.
10. *GEOFFROIUS KEIENSIS*, Salv.  
*G. timorlaoensis*, Meyer, op. sup. cit.
11. \**ECLECTUS RIEDELI*, Meyer.
12. \**EOS RETICULATA*, S. Müll.
13. *CACATUA SANGUINEA*, Gould.

## III. PICARLÆ.

14. SAUROPATIS CHLORIS, Bodd.  
15. S. SANCTA, V. & H.

## IV. PASSERES.

16. \*PIEZORHYNCHUS CASTUS (Sclater).  
*Monarcha castus*, Scl. P. Z. S. 1883, loc. sup. cit.  
17. \*HETERANAX MUNDUS (Sclater).  
*Monarcha mundus*, Scl. P. Z. S. 1883, loc. sup. cit.  
18. MONARCHA NITIDUS.  
19. \*RHIPIDURA HAMADRYAS, Sclater.  
20. \*RHIPIDURA FUSCO-RUFA, Sclater.  
21. \*RHIPIDURA OPISTHERYTHRA, Sclater.  
22. \*MYIAGRA FULVIVENTRIS, Sclater.  
23. \*MICRCECA HEMIXANTHA, Sclater.  
24. \*ARTAMIDES UNIMODUS, Sclater.  
*Graucalus unimodus*, Scl. P. Z. S. loc. sup. cit.  
25. GRAUCULUS MELANOPS (V. & H.).  
26. \*LALAGE MÆSTA, Sclater.  
27. ARTAMUS LEUCOGASTER, Val.  
*A. musschenbroeki*, Meyer.  
28. DICRUOPSIS BRACTEATUS (Gould).  
29. \*PACHYCEPHALA ARCTITORQUIS, Sclater.  
*P. kebirensis*, Meyer, op. sup. cit.  
*P. riedelii*, Meyer, op. sup. cit.  
30. \*P. FUSCO-FLAVA, Sclater.  
31. \*DICEUM FULGIDUM, Sclater.  
32. \*MYZOMELA ANNABELLE, Sclater.  
33. STIGMATOPS SQUAMATA, Salvad.  
34. \*PHILEMON TIMORLAUTENSIS, Meyer.  
*P. plumigenis*, Scl. P. Z. S. 1883, loc. sup. cit.  
35. \*ZOSTEROPS GRISEIVENTRIS, Sclater.  
36. \*GERYGONE DORSALIS, Sclater.  
37. \*ORIOIUS DECIPiens, Sclater.  
*Mimeta decipiens*, Scl. P. Z. S. 1883, loc. sup. cit.

38. \**GEOCICHLA MACHIKI*, H. O. Forbes.  
*Geocichla* sp. inc., Sclater, P. Z. S. 1883, loc. sup. cit.
39. *MUNIA MOLUCCA* (L.).
40. *ERYTHRURA TRICHROA* (Kittl.).
41. *CALORNIS GULARIS*, G. R. Gr.  
*C. metallica*, Sclater, P. Z. S. loc. sup. cit.  
*C. circumscripta*, Meyer, op. sup. cit.
42. \**CALORNIS CRASSA*, Sclater.
43. *CORVUS VALIDISSIMUS*, Schl.
44. (?) *EURYSTOMUS PACIFICUS*, Lath. fide Meyer, op. sup. cit.
45. *HIRUNDO JAVANICA*, Sparrm.

## V. COLUMBÆ.

46. *PTILOPUS WALLACHI*, Gr.
47. *P. XANTHOGASTER*, Wagl.  
*P. flavovirescens*, Meyer, op. sup. cit.
48. *CARPOPHAGA CONCINNA*, Wall.
49. *C. ROSACEA*, Temm.
50. *MYRISTICIVORA BICOLOR*, Scop.
51. *MACROPYGIA KEIENSIS*, Salv.  
*Macropygia* sp. inc., Sclater, P. Z. S. 1883, loc. sup. cit.
52. *GEOPELIA MAUGEI*, Temm.
53. *CHALCOPHAPS CHRYSOCHLORA*, Wagl.

## VI. GALLINÆ.

54. \**MEGAPODIUS TENIMBERENSIS*, Sclater.

## VII. GRALLATORES.

55. *ORTHORHAMPHUS MAGNIROSTRIS*, Geoff.
56. *CHARADRIUS FULVUS*, Gm.
57. *ÆGIALITIS GEOFFROYI*, Wagl.
58. *LOBIVANELLUS MILES*, Bodd.
59. *TOTANUS INCANUS*, Gm.
60. *NUMENIUS VARIEGATUS*, Scop.

- 61. ARDEA SUMATRANA, Raffles.
- 62. HERODIAS ALBA, L.  
*H. torra* (B. Ham.), Meyer, op. sup. cit.
- 63. DEMIGRETTA SACRA, Gm.
- 64. NYCTICORAX CALEDONICUS, Gm.
- 65. PORPHYRIO MELANOPTERUS, Temm.

#### VIII. NATATOIRES.

- 66. NETTAPUS PULCHELLUS, Gould.
- 67. DENDROCYGNA GUTTATA, Müll.
- 68. TADORNA RADJAH, Garn.
- 69. ONYCHOPRION ANÆTHETUS, Scop.

8. On some New and Little-known Species of Butterflies of the Genus *Teracolus*. By Lt.-Col. C. SWINHOE, F.L.S., F.Z.S.

[Received June 14, 1884.]

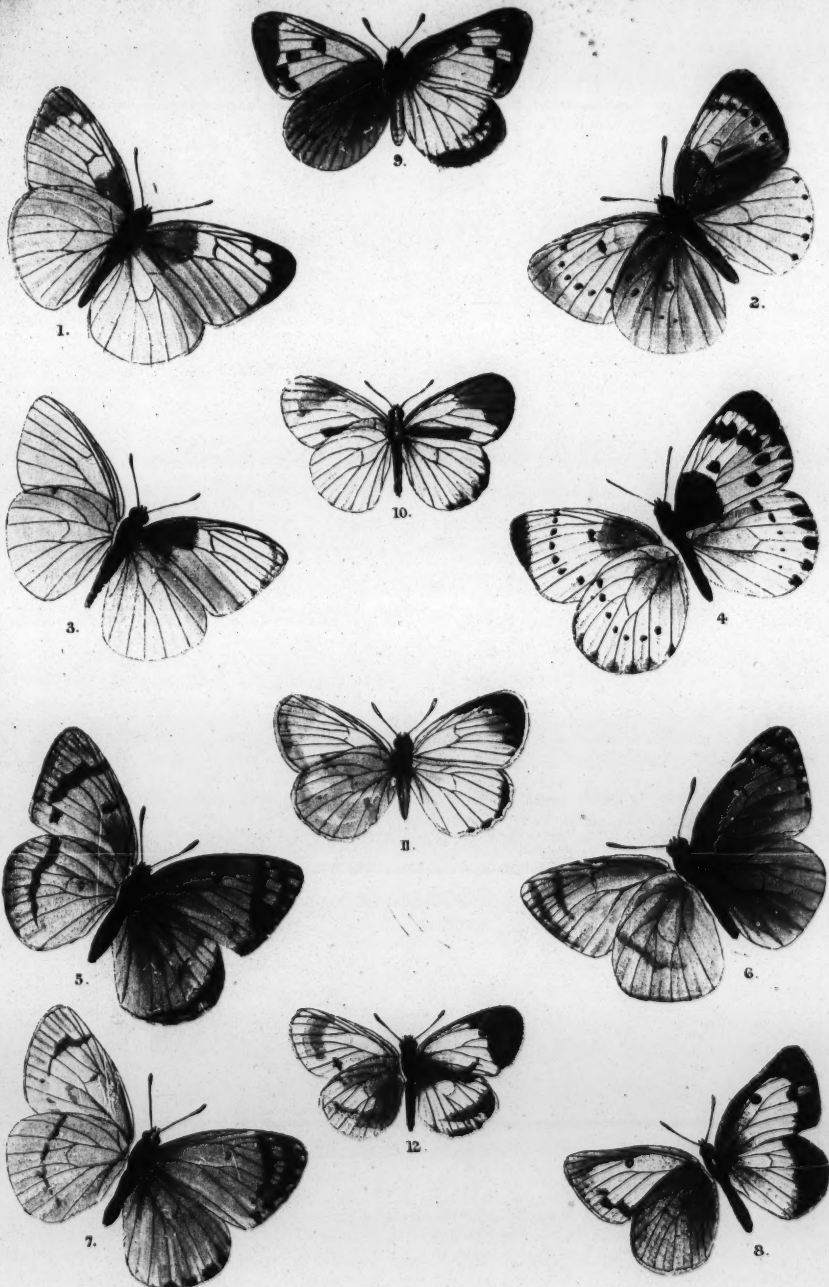
(Plates XXXIX. & XL.)

The Butterflies of the genus *Teracolus* of which this paper treats are very rare in collections; even the National collection contains but a poor lot of Asiatic specimens. The insects are of a very delicate nature, very difficult to capture without injury, and consequently many of the few specimens to be found in collections are represented by mere fragments.

These beautifully coloured delicate insects are, in the few species yet known, so much like one another, that many lepidopterists are inclined to club them together, and this more particularly with reference to the different species in the groups of *Teracolus faustus*, *T. danaë*, and *T. vestalis*, and indeed, until the appearance of Mr. Butler's revision of the genus in our 'Proceedings' in January 1876, the whole *T. vestalis* group, a perfectly distinct group of which there are many species, appear to have been looked upon as the females of *T. phisadia* of Godart. The only four species of the *T. vestalis* group yet described have been described by Mr. Butler.

The real home of this genus is the sandy desert, and it is a most extraordinary fact that, the worse the locality, where nature is a barren wilderness of nothing but intense heat and sand, the more beautiful are the species to be found there, many of them having patches of most brilliant golden orange—regular sun-patches, just as if these patches had been burnt into their wings by the sun.

I have here referred to and described 22 species in all, 16 of



R. Minton del et lith.

Minton Bros. imp.

SPECIES OF TERACOLUS.





2.



1.



3.



5.



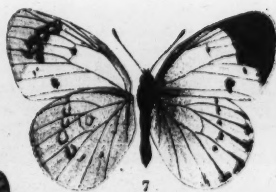
4.



8.



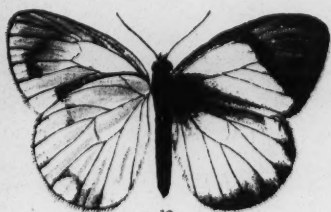
6.



7.



9.



10.



11.

R. Mintern del et lith.

SPECIES OF TERACOLUS.

Mintern Bros. imp.



which are new to science and the others very rare; four African, and the rest Asian. Four belong to Mr. Butler's 5th group, all Arabian; the centre of the wings containing sun-patches. Of these *T. halimede*, Klug, is the type; the females vary much in the ground-colour of the wings, and many are albinos. Three belong to Mr. Butler's 6th group, type *T. faustus*, Olivier; two Indian, one Arabian. The females of this group also vary very much in the ground-colour of the wings, and many are albinos. Five belong to Mr. Butler's 7th group, of which there are two types—*T. vestalis*, Butler, and *T. amatus*, Fabr.; three Indian and one Arabian of the first, and one Indian of the second. Five belong to the 8th group, of which there are also two types—*T. interruptus*, Butler, and *T. liagore*, Klug; three African and one Arabian of the first, and one Arabian of the second. Four belong to the 9th group, type *T. danaë*, Fabr., all Indian. One to a type between Mr. Butler's 9th and 10th groups—an African, having the shape and general appearance of the former, and the orange patch of the latter.

Group 5. Type *Teracolus halimede*, Klug.

1. TERACOLUS CÆLESTIS, n. sp. (Plate XXXIX. ♂ ♀, f. 1 & 2.)

Near *T. halimede*, Klug.

Aden, February and March, May to July.

♂. Above white. Fore wings with basal third and basal half of costa irrorated with bluish grey; band from centre of costa round the apical margin to centre of outer border greyish brown, forming a small apical patch, and fining down gradually both ways; a small band of same colour half across the apical space from the costa, differing in size in different specimens, and sometimes joining the apical band in the middle, forming a large subapical white spot; a deep black transverse streak at end of cell; all the veins greyish brown; and the whole space below the median nervules from the basal irrorations outwards brilliant orange.

Hind wing with a deep band of same colour in the costa, covering the whole space above the subcostal nervule, sometimes extending into the next interspace below, but not into the cell; remainder of hind wing pure white, and unmarked.

Below milky white, with the apex of fore wings and costal portion of hind wings suffused with pale orange.

♀. Above bright primrose colour. Fore wings with the basal third, costal border, and a deep marginal diffused band grey, a largish grey spot at end of cell, seven grey spots across the disk, and the lower half of the wing more or less covered with bright orange colour. Hind wings with the same colour on the costal portion, otherwise quite unmarked.

Below pale primrose; fore wings brighter than the hind wings, with the irrorations on the basal third, the spot at end of cell, and the discal spots showing through the wing.

Hind wings with a faint indication of a discal series of spots.

The above is the normal type; some of the females have a faint

marginal row of spots on the veins on the hind wings above; they vary much in the ground-colour of the wings, and many are albinos.

This is a very distinct species, and though allied to, is quite distinct from, *T. halimede*, Klug, more especially in the female.

Expanse of wings, ♂  $1\frac{5}{16}$  inch, ♀ 2 inches.

In coll. C. Swinhoe.

2. *TERACOLUS LEO*, Butler (Plate XXXIX. ♂, f. 3), Ann. Nat. Hist. ser. 3, vol. xvi. p. 397 (1865), though standing in his revision, P. Z. S. 1876, p. 133, as a synonym to *T. halimede*, is also, I believe, a distinct species. Mr. Butler's type came from the White Nile, and I have another identical with his type from Harkeko, and in both the apex and outer border are nearly colourless and very different from both Klug's plate or description of *T. halimede* (which comes from Arabia) and from mine. Probably a still greater difference will be found in the female when it is discovered. I give figures of all three.

In coll. B. M.

3. *TERACOLUS PLEIONE*, Klug, Symb. Phys. pl. 8, figs. 7, 8 (1829).

Aden, December to May.

Of this very rare species I have a series from Aden. The coloration in Klug's plate is very bad, and gives no idea of this very beautiful insect.

The females vary very much in colour—some are bright orange, some pale, and some pure albinos.

4. *TERACOLUS MIRIAM*, Felder, Reise der Nov., Lep. ser. 2, p. 190, n. 186, pl. 27. figs. 3, 4 (1865).

Aden, December to March.

This is put in Mr. Butler's revision as a synonym to the preceding species, but it is undoubtedly quite distinct. It differs in both sexes in having no border whatever to the hind wings, and in this important character there is no variation in the twenty examples before me.

In coll. C. Swinhoe.

#### Group. 6. Type *Teracolus faustus*, Olivier.

5. *TERACOLUS FAUSTUS*, Olivier, Voy. dans l'emp. Ott., l'Egypte et la Perse, Atlas, pl. 33. figs. 4, a, b. (1801).

*T. faustina*, Felder, Reise Nov., Lep. ii. p. 190, n. 187 (1865).

*T. oriens*, Butler, P. Z. S. 1876, p. 134, pl. vii. fig. 7.

I think both *T. faustina* and *T. oriens* must be taken out of the list of *Teracoli* and must become synonyms of *T. faustus*. I have examined the types with the assistance of Mr. Butler, and have compared them with a long series of *T. faustus*.

Mr. Butler's type of ♀ *T. oriens* is undoubtedly the normal type of female *T. faustus*, of which I have several.

The male described by Mr. Butler, and the male of *T. faustina* described by Felder, in no way differ from many specimens of *T. faustus*.

A species ranging through Persia and Afghanistan, Sind, and the North-west of India, shows naturally some slight differences in appearances, although, considering its wide distribution, it is wonderfully constant, as is almost every species of this peculiar genus.

6. *TERACOLUS SOLARIS*, Butler, P. Z. S. 1876, p. 135. (Plate XXXIX. ♀, f. 5.)

Deesa, Rajpootana.

The female of this species has been hitherto unknown.

♀. General colour dull orange salmon-colour, base irrorated with black-brown. Fore wings with the irrorations running along the costa to the apical patch, large spot at the end of the cell, costa, and apical patch black-brown, the patch continued broadly along the outer border, gradually lessening to the hinder angle, containing seven longitudinal small marginal spots and six larger submarginal spots of the ground-colour, but paler on the veins, and one diffuse brown spot standing out by itself in the interno-median interspace.

Hind wings with a deep macular black-brown border, with the discal band below showing through.

Below pale ochreish flesh-colour. Fore wings brighter and more orange-coloured towards the base; spot at end of cell large, brown with white centre; band across apex reddish brown, ending in a black-brown square spot on the second median interspace, with another square spot of same colour in the space below, disconnected, and more inside the wing.

Hind wing—spot at end of cell and discal band reddish brown; fringe of both wings of same colour.

The above is the normal type, but the ground-colour of the females of this species, as in *T. faustus*, varies very much, some being very pale, and some pure white.

This species is marked by Mr. Butler in his revision of the genus as from "Scinde?," but it never could have come from Sind. I have taken many at Deesa, and the species belongs to Rajpootana; and I may here remark that *T. fulvia*, Wallace, belongs to the Deccan, to Madras, and the south of India, and not to the North-west as therein stated. I have many specimens taken at Poona, and a pair of the variety *T. tripuncta*, Butler, taken at Madras, and Mr. Moore has some from the same locality.

Expanse of wings 2 inches.

In coll. C. Swinhoe.

7. *TERACOLUS* vi, n. sp. (Plate XXXIX. ♂ ♀, figs. 6 & 7.)

Aden, July and August, 1883.

♂. Wings above coloured and marked like *Teracolus faustus*, Olivier; the orange colour above is, however, brighter and different

from any of the species yet described, the embossed spot on the internal area of the fore wings, peculiar to this group, is also very distinct, and the transverse spot at the end of the cell is small and pale.

Below, the general colour of both wings is pale orange-yellow, with the inner border of the apex of the fore wings showing through the wing, and a faint shade of a discal band on the hind wings; otherwise both wings are immaculate.

♀. Above, ground-colour darker and yellower than the males, irroration at the base, the spot at end of the cell of fore wings, and the black-brown markings on both wings generally paler and broader.

Below, it has the general appearance of the male, but slightly darker, with the addition of two pale-brown spots in the internomedian interspace.

Expanse of wings, ♂ ♀  $2\frac{1}{10}$  to  $1\frac{8}{10}$  inch.

This is a very distinct species.

In coll. C. Swinhoe.

#### Group 7. Type *Teracolus vestalis*, Butler.

##### 8. TERACOLUS RORUS, n. sp. (Plate XXXIX. ♂, fig. 8.)

Sukkur (North Sind), February 1882.

♂ ♀. Resemble on both surfaces the female of *T. puellaris*, Butler, even to the third spot near the outer margin below being extended downwards and expanding upon the inner margin, differing not only in this from *T. ochreipennis* and *T. intermissus* (of which I have many examples), but is larger, and the outer border of secondaries is much darker and deeper, fines down a little, and stops short of the anal angle. I have examined a long series taken at the same time and place.

Expanse of wings, ♂ ♀  $1\frac{6}{10}$  to  $1\frac{7}{10}$  inch.

In coll. C. Swinhoe.

As this group, of which *T. vestalis* is the type, is very indifferently understood, it might be as well to give their distinctive characteristics, which apparently never vary, and by which each of the following species can readily be identified:—

*T. vestalis*, Butler. Below, both sexes, both wings sulphur-yellow, fore wings with three black spots near outer margin below the median branches, the centre one the largest.

*T. ochreipennis*, Butler. Below, both sexes with the three spots on the fore wings as in *T. vestalis*; hind wings in both sexes flesh-colour, marginal border of the hind wings above unmarked and like *T. vestalis*.

*T. intermissus*, Butler, P. Z. S. 1883, p. 152, pl. xxiv. fig. 4. Similar to *T. ochreipennis* below; above, the marginal band of the hind wings is narrow and wavy.

*T. puellaris*, Butler. Below, fore wings with the lowest of the three spots extending downwards and expanding upon the inner margin in both sexes.

♂. Both wings below sulphur-yellow.

♀. Fore wings below sulphur-yellow, hind wings flesh-colour.

*T. rorus*, C. Swinhoe. Below, both sexes with the spots in the fore wings as in *T. puellaris*; both sexes with the hind wings flesh-colour.

I think *T. intermissus* is a doubtful species, but the other four are quite distinct and easy to distinguish.

9. *TERACOLUS PEELUS*, n. sp. (Plate XXXIX. ♂, fig. 9.)

Kurrachee, May and September.

♂ ♀. Bright sulphur-yellow above. Fore wings with a broad irregular marginal black-brown border; three sulphur-yellow spots placed obliquely below and lessening in size from the apex, a third much larger spot on the second median interspace, a small dot below this spot, and a diffuse slightly smaller spot near the hinder angle, in some specimens running into the angle and cutting the outer border shorter at the submedian nervule; seven pale-yellow dots on the margin, the last two close together, near the hinder angle; costal margin greyish yellow, in some specimens with a tinge of flesh-colour; a large black spot at the end of the cell; the basal half of the subcostal area, discoidal cell (excepting its inferior angle), and the base of the interno-median area black-brown. Hind wings with the black border exactly like *T. intermissus*.

Under surface of wings sulphur-yellow, with the costa, apex, and outer border flesh-colour, with the spots arranged as in *T. vestalis*. Hind wings flesh-colour, a distinct dark spot at the end of the cell, and a few faint discal spots limiting the outer border, which is distinctly visible through the wing.

Expanse of wings, ♂ ♀  $1\frac{3}{4}$  to 2 inches.

In coll. C. Swinhoe.

10. *TERACOLUS DUBIUS*, n. sp.

Kurrachee, July and September.

♂. Like *T. vestalis*, Butler, but has altogether a different appearance. Above, the suffused black patch from the base runs right into the very large spot at the end of the cell, and continues along the costa in a uniform band until it runs into the outer marginal band; this band on both wings being much deeper than is usual in the groups.

Below, the general ground-colour is dirty primrose, the apex of the fore wings and the whole surface of the hind wings are tinged with flesh-colour; spots on the fore wings arranged as in *T. vestalis*, but much larger. Hind wings with a dot at the end of the cell, and a discal series of seven large reddish-brown spots, the fourth being much the largest.

Expanse of wings,  $1\frac{3}{4}$  inch.

In coll. C. Swinhoe.

11. *TERACOLUS PHISADIA*, Godart, Enc. Méth. ix. p. 132, n. 40 (1819).

Is identical with *T. arne*, Klug, Symb. Phys. t. 7. f. 1-4 (1829). Aden, January and February.

This rare species is the common form of this group at Aden, and I have a good many examples of both sexes: some of the females are yellow, some white, all more or less suffused with pale pinkish salmon-colour.

Group 7a. Type *Teracolus amatus*, Fabr.

12. *TERACOLUS KENNEDII*, n. sp.

Ahmednuggur, November 1883.

♂. Fore wings marked like *T. modestus*, Butler. Differs in having the black band round the wings much narrower and the spot on the interno-median interspace disconnected from the marginal band. Hind wings, above, a deep black band on the costa for two thirds of its length from the base, a black marginal border, and three submarginal black spots connected with the border by black irroration, which also continue broadly up the inner margin, and four marginal salmon-coloured dots in the band. Below, it is identical with *T. modestus*.

♀. Marked above somewhat like the male, but the submarginal black spots on the hind wings are joined together, doubling the depth of the border, which has four marginal salmon-coloured dots and five large submarginal spots of the same colour; and the costal black band of the male is altogether absent.

Below, it is primrose-colour, with the apex of the fore wings and the whole surface of the hind wings suffused with salmon-colour; a large white-centred black spot at the end of the cell of each wing, larger in the fore wings; a whorl of seven black spots in the disk of the fore wings, the first five pale; and a whorl of seven spots in the disk of the hind wings, all pale.

Expanse of wings, ♂ ♀  $1\frac{1}{2}$  inch.

In coll. C. Swinhoe.

Group 8. Type *Teracolus interruptus*, Butler.

13. *TERACOLUS XANTHUS*, n. sp. (Plate XXXIX. ♂ ♀, figs. 10 & 11.)

Between Berber and Khartoum (*Petherick*).

♂. Marked like *T. galanthus*, Butler, the outer macular band on the hind wings above being single, instead of double as in that species.

Below pale primrose, the basal half of fore wings and apex yellow, with a faint orange band crossing the latter; a black-brown spot on the interno-median interspace, corresponding to the end of the band on the inner margin above, a faint spot at the end of the cell. Hind wings with a spot at the end of the cell, on a saffron-yellow ground; basal third of costa same colour.

♀. Antennæ black; body, head, and general colour of wings above primrose; apical patch reddish brown, inner border irregular and toothed on the veins, and diffused with pale brownish orange. Hind wings with a reddish brown macular border. Below marked as

in the male, the yellow on the fore wings suffusing the wing throughout, and the entire surface of the hind wings deepened to saffron-colour.

Expanse of wings, ♂  $1\frac{4}{10}$ , ♀  $1\frac{1}{2}$  inch.

In coll. B. M.

14. *TERACOLUS YERBURII*, n. sp. (Plate XXXIX. ♂, fig. 12.)

Haithalkim near Aden, March 1883.

♂. Near *T. दौरا*, Klug. Is, however, quite distinct, differing from both the plates and the description in having the base of all the wings deeply irrorated with black-brown, which extends in the form of a deep band along the inner margin of the fore wings to the black spot on the interno-median interspace. In the hind wings by having a large black-brown spot on the costa corresponding to the spot on the fore wings, which also forms a limit to the basal irrorations, the irrorations on this wing covering the entire basal third.

Expanse of wings,  $1\frac{8}{10}$  to  $1\frac{4}{10}$  inch.

In coll. C. Swinhoe.

Group 8a. Type *Teracolus liagore*, Klug.

15. *TERACOLUS SAXEUS*, n. sp. (Plate XL. ♂ ♀, figs. 1 & 2.)

Haithalkim, near Aden, March 1883.

Near *T. liagore*, Klug.

♂. Differs above in having the base powdered with black-brown, in having a smaller apical patch, and in having the outer black-brown border thicker and dentated, and with the lines running halfway through the patch on the veins.

Below it differs in having a black spot on an orange ground at the end of the discoidal cell in the hind wings, and the inner half of the costa of the same colour; whereas in *T. liagore*, both in Klug's plate and in the only specimen in the British Museum, the hind wing below is immaculate.

♀. Has the apex of the fore wings more rounded; otherwise above and below it is similar to the male, but with all the colours paler.

Expanse of wings, ♂ ♀  $1\frac{4}{10}$  to  $1\frac{3}{10}$  inch.

In coll. C. Swinhoe.

Klug's plate of the female of *T. liagore* is undoubtedly a mistake: the insect therein represented does not belong to this group at all, but is a male of the *T. दौरा* group.

16. *TERACOLUS ODYSSEUS*, n. sp. (Plate XL. ♂, f. 3.)

White Nile (*Petherick*).

Allied to *T. glycera*, Butler.

♂. Without the deep band on the inner margin of fore wings, with the black outer border of the apical patch deeper, and with an inner band interrupted above the middle; and in the hind wing in having the black macular border less pronounced.

♀. Much resembles a faded female of *T. glycera*; the apical

border is immaculate, and the band joining the band on the inner margin to the apical patch is absent.

Expanse of wings, ♂  $1\frac{4}{10}$ , ♀  $1\frac{1}{2}$  inch.

In coll. B. M.

17. *TERACOLUS FUMIDUS*, n. sp. (Plate XL. ♂ ♀, f. 4 & 5.)

Transvaal (*Druce*).

Apex of wings of both sexes more acute than is usual in the group; body, head, and antennæ black.

♂. Upper surface of both wings white; costa deep black, a distinct black spot at the end of the cell; a large carmine apical patch, divided by the veins into five parts, each vein ending in a triangular spot on the outer border; the patch surrounded by a diffuse black-brown border, which fines down to the first median nervule, and continues in a fine line down the outer border to the hinder angle, ending in a spot; the base finely irrorated with black-brown; and a very deep black-brown band extending along the interior border from the base for two thirds of its length.

Hind wings with a faint spot at the end of the cell; the veins finely black-brown, thickening outwards; base dark black-brown, forming a deep band on the costa, corresponding to the band on the fore wings.

Below faint pinkish white. Fore-wings lighter than hind wings, a minute spot at the end of the cell; apex yellowish, crossed with a faint orange band, with four darker-coloured faint spots, running through it, one in each interspace, the black band showing through the wing darkly at its extremities.

Hind wing with a black spot at the end of the cell, on a saffron-yellow ground, basal half of costa same colour, and with all the veins powdered with brown.

♀. Ground-colour of both wings white above. Fore wings with a large spot at the end of the cell; costa black; apical patch black-brown, with five orange-carmine longitudinal spots, the third largest and with this colour showing through the entire patch; fringe alternately brown and pale orange-carmine; the base and band much deeper and darker-coloured than in the male, filling two thirds of the discoidal cell and all the space beneath, terminating with an elbow at the end pointing towards the apex.

Hind wing with the basal third black-brown, the same colour running in a deep band along the costa and the outer border, leaving two large white spots near the apex, and a large white patch near the anal angle, and running up in a diffused band near the inner margin, leaving only the margin and a large central patch white: below it is marked as in the male, but the markings are all more pronounced, and the ground-colour of the hind wings a deeper pinkish-white tinged with yellow.

Expanse of wings, ♂ ♀  $1\frac{1}{2}$  inch.

In coll. B. M.

Group 9. Type *Teracolus danaë*, Fabr.

18. *TERACOLUS PHŒNIUS*, Butler, Ann. Nat. Hist. ser. 4, vol. xviii. p. 488 (1876).

The type is said to be from Abyssinia. It is very rare in collections and is a beautiful species.

I have a long series of both sexes taken at Kurrachee, June, July, and August, 1879. The discal series of double spots on the hind wings below is distinctly marked, and very regular in all the specimens I have examined, making it an easily distinguishable species.

19. *TERACOLUS IMMACULATUS*, n. sp.

Kurrachee, August 1879.

♂. Upper surface and primaries below similar to males of *T. phœnius*, Butler; secondaries below pure white, with two black spots close together at the end of the cell, with a carmine spot between them, a dark-brown spot on the centre of the costa, and a dot below, the discal series of spots entirely wanting, the macular border visible through the wing.

This may be only a variety of the preceding species; but the appearance of the under surface is very distinct and unlike any other species in the group.

Expanse of wings,  $2\frac{3}{10}$  inches.

20. *TERACOLUS SUBROSEUS*, n. sp. (Plate XL. ♂ ♀, f. 6 & 7.)

Kurrachee, April to July.

♂. Upper surface pure white; costa finely grey, a little grey powder at the base above the cell, a faint minute spot at the end of the cell; a large carmine apical patch with narrow clear-cut black-brown costal border, with black-brown angular spots on the outer border on each vein, the last spot extending below the patch on to the second median nervule; a slight diffuse inner black-brown border.

Hind wing pure white, with a minute black-brown spot on each vein along the outer border.

Below—fore wing white, a minute faint transverse spot at the end of the cell; apical area dark rosy flesh-colour, partially bordered on the inner side with four red-brown square double spots commencing from the costa, one between each pair of nervules.

Hind wing rosy flesh-colour, with a double red-brown dot at end of the cell, a discal series of four double faint red-brown spots between the nervules, from the costa downwards, and in some examples a faint trace of another double spot near the interior border.

♀. Upperside white, costa and basal area powdered with rosy grey; apical patch with six large carmine-orange spots divided by the veins, which thicken outwardly, forming a diffuse apical and outer border, descending to the last submedian nervule; four double black-brown spots on the inner side, from the costa downwards, one on each interspace, running just within the patch, one similar black-

brown spot outside on the next interspace below, a spot at the end of the cell, and a double spot in the centre of the interno-median interspace.

Hind wing white, slightly powdered with rosy grey near the base; a discal series of five black-brown spots, from the costa downwards within the veins, a marginal series of five similar spots on the veins; fringe sulphur-yellow.

Underside marked and coloured exactly as in the males with the addition in the fore wings of the fifth discal spot, and the interno-median spot; basal third suffused with sulphur-yellow; secondaries with a clear-cut ringlet of red-brown, at the end of the cell.

Expanse of wings, ♂  $1\frac{7}{10}$  to  $1\frac{9}{10}$ , ♀ 2 to  $1\frac{1}{2}$  inch.

Most of the females are very diminutive.

I have a pair of this species from Sukkur taken in January 1882, and two females in my collection marked W. and J. Canal.

In coll. C. Swinhoe.

21. *TERACOLUS TAPLINI*, n. sp. (Plate XL. ♂ ♀, f. 8 & 9.)

♂ Bombay, ♀ Poona, May 1883.

Near to *T. sanguinalis*, Butler, the primaries shorter, with less oblique outer margin, the apical patch of carmine of a brighter clearer colour, with its inner border in-arched towards the costa in the male; the costal border and basal area less strongly dusted with grey scales; secondaries in both sexes with the blackish marginal spots well separated. The ground-colour of the female decidedly whiter than in *T. sanguinalis*, which is suffused with sulphur-yellow; under surface of the secondaries in the male flesh-coloured instead of white, of the female creamy white instead of yellowish.

Expanse of wings, ♂ ♀  $1\frac{4}{5}$  inch.

♂ in coll. B. M. ♀ in coll. C. Swinhoe.

22. *TERACOLUS SIPYLUS*, n. sp. (Plate XL. ♂ ♀, f. 10 & 11.)

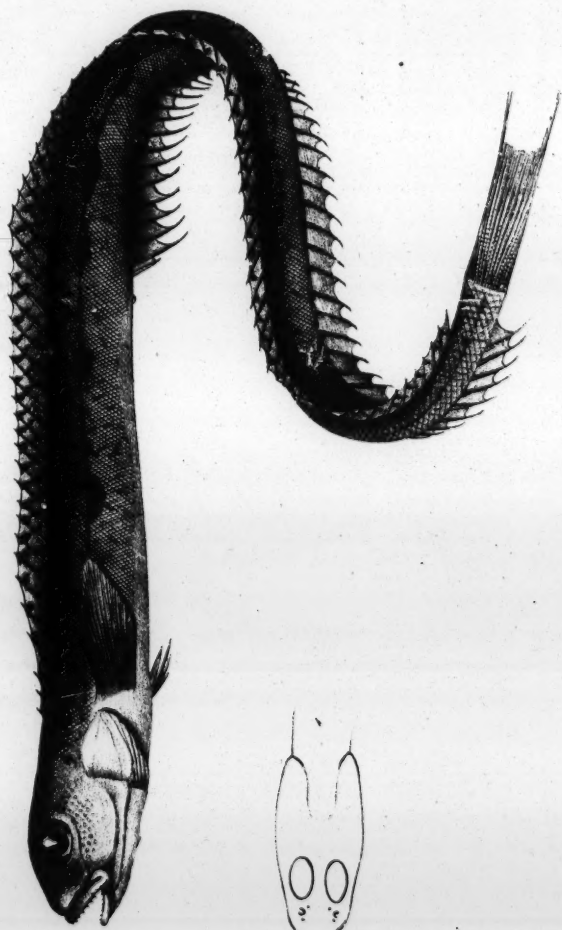
Zanzibar (*Moir*).

Comes between the *T. danaë* and *T. etrida* groups: is shaped like the former, but has the apical patch of the orange-colour of the latter.

♂. Above white. Fore wings—costa black, base deeply irrorated with black, with long pale bluish-grey hairs, the irrorations running along the inner margin in a broad diffused band for two thirds of its length; apical patch large, with a deep all-round black border, the outer one running into the veins, forming long teeth, the inner one thickening downwards to the first submedian nervule, and from thence in an even line to the hinder angle. Hind wing with the base irrorated as above, with a band on the costa corresponding to the band on the fore wings; outer border deep and continuous.

Below white. Fore wings—costa pale black, outer border of same colour marking the veins; apex with a broad orange-red band running across, with a brown band through it, the black band on the inner margin showing through the wing. Hind wing with the basal half of the costa orange-red, outer border with the band showing through





F. Day del. J. Smith lith.

LUMPENUS LAMPETRIFORMIS.

Hood's imp.

on the veins; a pale brown diffuse spot in the apical third of the costa.

♀. Above and below almost exactly similar to the female of *Teracolus subvencosus*, Butler, the only difference being in the coloration below, having the ground-colour darker, so that the markings are not so pronounced.

Expanse of wings, ♂ 2, ♀  $1\frac{8}{10}$  inch.

In coll. B. M.

#### EXPLANATION OF THE PLATES.

##### PLATE XXXIX.

Fig. 1. *Teracolus celestis* ♂, p. 435.

2. ——— ♀, p. 435.

3. ——— *leo* ♂, p. 436.

4. ——— *halimede* ♀, p. 436.

5. ——— *solaris* ♀, p. 437.

6. ——— *vi* ♂, p. 437.

7. ——— ♀, p. 437.

8. ——— *rorus* ♂, p. 438.

9. ——— *peelus*, ♂, p. 439.

10. ——— *xanthus* ♂, p. 440.

11. ——— ♀, p. 440.

12. ——— *yverburi* ♂, p. 441.

##### PLATE XL.

Fig. 1. *Teracolus sareus* ♂, p. 441.

2. ——— ♀, p. 441.

3. ——— *odysseus* ♂, p. 441.

4. ——— *fumidus* ♂, p. 442.

5. ——— ♀, p. 442.

6. ——— *subroseus* ♂, p. 443.

7. ——— ♀, p. 443.

8. ——— *taplini* ♂, p. 444.

9. ——— ♀, p. 444.

10. ——— *sipylus* ♂, p. 444.

11. ——— ♀, p. 444.

#### 9. On the Occurrence of *Lumpenus lampetriformis* off the East Coast of Scotland. By FRANCIS DAY.

[Received June 16, 1884.]

##### (Plate XLI.)

On May 31st this year I received information from Professor McIntosh, of St. Andrews, that a fish new to the British fish-fauna had been captured 15 miles off St. Abbs Head in 40 fathoms water by means of a trawl; and a few days subsequently he was good enough to send me the specimen, with permission to figure and describe it.

The fish is in excellent condition, 10·7 inches in length, and belongs to the Blenniidae. Different generic names have been given to the genus to which it pertains, as *Stichæus* and *Ctenodon*; but Gill (Proc. Acad. Nat. Sci. Philad. 1864) showed that *Lumpenus* has the priority; and Collett (Norwegian North-Atlantic Expedition,

1876-78) has so fully worked out the various forms that further remarks are unnecessary.

Gill divided the genus *Lumpenus* into three subgeneric groups:—

(1) *Leptoclinus*, with teeth in the jaws, palatine bones, and vomer.

(2) *Lumpenus*, with teeth in the jaws and palatine bones.

(3) *Leptoblennius*, with teeth in the jaws only.

To this last subdivision belongs the fish obtained off St. Abbs Head.

**LUMPENUS LAMPETRIFORMIS. (Plate XLI.)**

*Blennius*, &c., Mohr, Forsög Isl. Nat. p. 85, t. iv (1786).

*Blennius lampetra-formis*, Walb., Artedi, p. 184, pl. iii. fig. 6 (1792).

*Lumpenus lampetra-formis*, Collett, Norw. North-Atl. Exp. 1876-78, p. 71 (see synonymy).

B. vi. D. 72. P. 14. V. 1/4. A. 1/51. C. 13. Cæc. pyl. 2.

	inch.
Length of specimen .....	10·7
„ head .....	1·2
„ caudal fin .....	1·2
„ pectoral fin .....	0·8
Height of body .....	0·6
„ dorsal fin .....	0·4
„ anal fin .....	0·4

Eyes one diameter from the end of the snout and one third of a diameter apart.

Body strongly compressed. Upper jaw slightly the longer. Nostril with a short tube, one large pore anterior, and another posterior to it. *Teeth* in several rows in the upper jaw, a double row in the front portion of the lower jaw, decreasing laterally to one. Branchial opening wide, extending forwards to beneath the hind edge of the eye. Vent situated at 3·7 inches from the end of the snout, or at about the commencement of the second third of the total length. *Fins*. All the dorsal rays spinate, the first three short and commencing above the hind edge of the opercle, then gradually increasing in length to above the vent, a short distance subsequent to which they gradually decrease; the last dorsal spine laid flat does not extend to above the base of the caudal fin. Pectoral with its four lower rays thickened. Ventrals with one spinate ray and four branched ones; it is inserted slightly before the base of the pectoral. Anal with one spine and 51 rays which are very indistinctly branched, the inter-radial membrane deeply cleft, the last ray reaching to the base of the caudal fin. Caudal with one elongated ray above and another below, the five intermediate ones being somewhat concave, the remainder being shorter. Most probably this elongation is a sexual indication, this fish being a male. Cæcal appendages two rather large ones. *Scales*. A few non-imbricate ones on the cheeks; those on the body increasing in size posteriorly. *Colours*. Pinkish-



1



2



J. Smit lith.

Hankart imp.

1. *HESPEROMYS LATICEPS* Var *NITIDUS*.  
2. *H. BIMACULATUS* Var *LEPIDUS*.





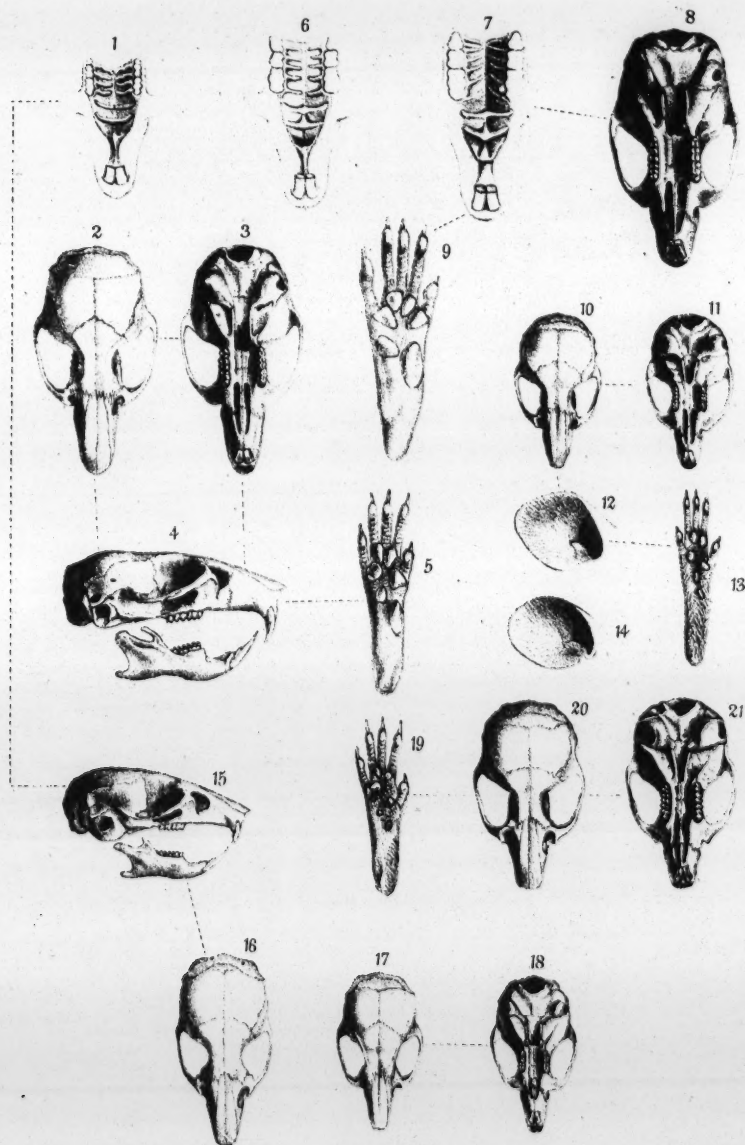
J Smit lith.

2

Heahart imp.

1. HESPEROMYS SCALOPS.  
2. RHEITHRODON PICTUS.





P.J. Smit lith.

Hanhart imp.

16	HESPEROMYS	SCALOPS.	10-13	HESPEROMYS	BIMACULATUS	Var	LEPID
"	"	CINEREUS.	14	"	"	Typ.	Var.
"	"	LATIMANUS	17, 18	"	SPINOSUS.		
"	"	LEUCODACTYLUS.	19-21	RHEITHRODON	PICTUS.		

yellow, covered with small spots and a few blotches along the lateral line. Dorsal fin with oblique transverse bars. Caudal colourless, with the ends of the rays yellow, and a few indistinct transverse bands.

*Geographical Distribution.* Up to the present time this species has been recorded from the coasts of Greenland and Iceland. It is common off Spitzbergen and on the shores of North-western Europe as far south as the Cattegat. In the North its range extends certainly as high as 80°. Collett observes that along the coast of Norway it appears to be rather a common fish in most localities.

Irrespective of the interesting fact of this fish being new to the British fish-fauna, it is likewise remarkable for the two elongated caudal rays, which give to this male specimen a different appearance from that of previous figures and descriptions. This fish will form an addition to the Zoological Museum of the University of St. Andrews, which Professor McIntosh is taking so much pains to enlarge and improve.

#### 10. On a Collection of *Muridæ* from Central Peru.

By OLDFIELD THOMAS, F.Z.S., Natural History Museum.

[Received June 17, 1884.]

(Plates XLII.—XLIV.)

During the years from 1870 to 1873 the well-known Polish traveller M. Constantin Jelski obtained the present fine collection of *Muridæ* for the Warsaw Museum, and it is to the Director of that Museum, Prof. L. Taczanowski, that I owe the opportunity of working out this most interesting series of Sigmodont Rats and Mice.

The specimens were all collected in that part of Central Peru which is contained in a triangle of which Lima, Junin, and Huanta form the three apices, the greater part of them coming from Junin itself.

Prof. Taczanowski has furnished me with the following notes on the stations at which the *Muridæ* were collected:—

"*Junin.*—Region of the 'puna,' or mountain grass-land, close to the lake of the same name, called also Lake Chinchacocha, one day distant from Tarma, the capital of the Department Junin. The lake is situated in the centre of a marshy prairie abounding in small lakes and streams, and covered in many places with thick patches of rushes.

"*Amable Maria.*—Farm situated between the streams of Chanchamayo and Anamayo, at a little distance from the river Tutumayo, at an altitude of about 2000 feet above the sea.

"*Maraynioc.*—A farm close to the source of the Aynamayo, near the valley of Chanchamayo."

The present paper is practically a continuation of that read before this Society in 1882, when the collection obtained by M. Stolzmann in the extreme north of Peru was described, this still larger series

from a different locality enabling us to increase somewhat our scanty knowledge of the Peruvian Muridæ.

The collection consists of no less than 92 specimens, belonging to 12 species, of which one belongs to *Holochilus*, one to *Rheithrodon*, and the remainder to *Hesperomys*, representing the subgenera *Rhipidomys* (1), *Oryzomys* (3), *Calomys* (1), *Vesperimus* (1), and *Habrothrix* (4). Of these, one species, *Rheithrodon pictus*, is new; and two, *Hesperomys laticeps*, var. *nitidus*, and *H. bimaculatus*, var. *lepidus*, represent new varieties of species already described. Good series of specimens of each of the new forms are in the collection, so that their characters and variability, so far as occurs at a single locality, can be fairly made out.

In the subgeneric names used in 1882 I simply accepted the groups as defined by Baird<sup>1</sup>, and used by other authors up to the present time; but on a closer investigation I find that the subgenera proposed by Waterhouse<sup>2</sup> in 1837 should stand to a much greater extent than was allowed by Baird, who merely went upon Waterhouse's descriptions, without seeing any specimens of such subgenera as *Phyllotis*, *Calomys*, or *Scapteromys*, each of which is fully entitled to the same rank as the other groups.

The following are the subgenera into which the unwieldy genus *Hesperomys* may be most satisfactorily divided:—

**RHIPIDOMYS**, Tschudi.—Form myoxine; tail long, hairy, pencilled at the tip; feet very short, broad, with large sole-pads; mammæ 1 or 0-2=6 or 4; interdental palate-ridges 5 or 6.

Skull with the cranial portion very large as compared to the facial; interparietal large; supraorbital margins ridged; palatal foramen of medium length.

Teeth large, their pattern as in the larger *Oryzomys*.

Species:—*H. leucodactylus*, Tsch. (type), *H. latimanus*, Tomes, *H. pyrrhorhinus*, Wied., *H. sumichrasti*, De Sauss., and (?) *H. bicolor*, Tomes.

Range. Amazonian Subregion, Ecuador, and Peru.

**ORYZOMYS**, Baird.—Form murine; tail long, scaly; feet long; soles quite naked; mammæ 2-2=8; interdental palate-ridges 5.

Skull generally strongly made; supraorbital edges and palatine foramina various.

Teeth with broad, low, complex crowns, the folds in which remain until old age.

Species:—*H. palustris*, Harl. (type), *H. angouya*, Desm., *H. albigularis*, Tomes, *H. galapagoensis*, Waterh., *H. longicaudatus*, Benn., *H. spinosus*, Thos., &c., &c., nearly 30 in all.

Range. Southern United States to Cape Horn, most numerous in the more tropical districts.

<sup>1</sup> Mamm. N. Am. p. 454 (1859).

<sup>2</sup> P. Z. S. 1837, p. 20.

**CALOMYS**, Waterhouse.—Form cricetine; tail short, hairy; fur very long and soft; feet small and slender, soles thickly hairy; mammæ 2-2=8.

Skull slightly made; interparietal very narrow from before backwards; interorbital edges square; palatine foramina long.

Teeth as in the smaller *Oryzomys*.

Species:—*H. bimaculatus*, Waterh. (type), *H. elegans*, Waterh., and *H. gracilipes*, Waterh.

Range. From Peru across the continent southwards to Buenos Ayres and Bahia Blanca.

**VESPERIMUS**, Coues.—Form murine; tail medium or long, thinly hairy; ears and feet large; mammæ 1-2=6.

Skull generally lightly made, with large interparietal, rounded or square supraorbital margins, little developed anterior plate of zygoma root, and long palatine foramina.

Teeth with low complicated crowns, the folds generally alternating on the two sides of each tooth.

Species:—*H. leucopus*, Raf. (type), *H. californicus*, Gamb., *H. aztecus*, De Sauss., *H. cinereus*, Thos., *H. tacunowskii*, Thos., &c., &c., about 10 in all.

Range. North America, southwards to Peru.

**ONYCHOMYS**, Baird.—Form arvicoline; tail and ears very short; fore feet very large, with elongated claws; hind feet short, with hairy soles and only four sole-pads; mammæ 0-2=4.

Skull and teeth much as in *Vesperimus*.

Species:—*H. leucogaster*, Wied. (type), and *H. torridus*, Coues.

Range. Southern United States.

**SCAPTEROMYS**, Waterhouse.—Form murine; tail long and hairy; feet unusually long; thumb with a claw instead of a nail.

Skull and teeth much as in *Habrothrix*, but upper part of infraorbital foramen larger, anterior plate more prominent, and teeth broader and heavier.

Species:—*H. tumidus*, Waterh. (type), *H. tomentosus*, Licht.

Range. La Plata.

**PHYLLOTIS**, Waterhouse.—Form murine; tail of medium length, hairy; ears very large; feet short, soles naked; mammæ 2-2=8; interdental palate-ridges 5.

Skull with large interparietal, square or slightly beaded supraorbital margins, long palatine foramina, and very prominent zygomata.

Teeth as in *Habrothrix*.

Species:—*H. darwini*, Waterh. (type), *H. boliviensis*, Waterh., *H. griseostavus*, Waterh., and *H. xanthopygus*, Waterh.

Range. Patagonian Subregion.

<sup>1</sup> Apud Peters, Abh. Ak. Berl. 1860, p. 147.

**HABROTHRIX**, Waterhouse.—Form arvicoline; tail short, thinly hairy; fur generally long and soft; ears and feet short; soles naked; thumb with a nail; mammæ 2-2=8; interdental palate-ridges 4.

Skull with long facial portion, very small interparietal, rounded supraorbital margins, and long palatine foramina.

Teeth with high conical crowns, the folds in which soon wear out, leaving a simple indented outline.

Species:—*H. longipilis*, Waterh., *H. olivaceus*, Waterh., *H. xanthorhinus*, Waterh., &c., &c., about 20 in number.

Range. Patagonian Subregion; northwards on the west to Ecuador, and on the east to South Brazil.

**OXYMYCTERUS**, Waterhouse.—Like *Habrothrix*, but with a nail instead of a claw on the thumb, and with an elongated muzzle. Anterior plate scarcely developed, its edge slanting.

Species:—*H. nasutus*, Waterh. (type), *H. hispidus*, Pict., *H. rufus*, Desm., &c.

Range. South-Brazilian Subregion.

*Megalomys*, Trouess.<sup>1</sup>, founded on *H. pilorides*, Pall., seems to me to fall within the genus *Holochilus*, Bdt., and not to be a true *Hesperomys* at all.

*Tylomys*, Peters (*Neomys*, Gray), should, on the other hand, be certainly allowed separate generic rank, chiefly on account of its very peculiarly shaped infraorbital foramen, which is of the same breadth above and below, and to which there is no projecting external anterior plate of the zygoma-root, the outer wall of the foramen being absolutely cut back instead of projecting forwards. The remarkable supraorbital ledges are also quite unique. (See Peters's figures, MB. Ak. Berl. 1866, p. 404.)

By the above arrangement it will be seen that the name *Calomys* is restricted to the small group to which it was originally applied by Waterhouse; that *Oryzomys*, which hitherto was supposed to include only two North- and Central-American species, really contains the great mass of the South-American muriform Vesper-mice to which *Calomys* has been commonly applied; and that the range of Dr. Coues's subgenus *Vesperimus* extends down as far south as Peru, since it contains the two species *H. cinereus* and *H. taczanowskii*, formerly placed by me with much doubt in *Rhipidomys*, but which I now think must either be referred to *Vesperimus* or be made the types of a new subgenus, a course which I am unwilling to adopt without absolute necessity.

With regard to the geographical aspect of M. Jelski's collection as compared with that of M. Stolzmann's, the more southern locality of the former results in the dropping out of the Ecuadorean and Amazonian species, such as *Hesperomys latimanus*, *pyrrhorhinus*, *taczanowskii*, and *albigularis*, and the appearance of such Chilean and Patagonian forms as *Rheithrodon pictus*, *H. scalops*, *H. xanthorhinus*,

<sup>1</sup> 'Le Naturaliste,' 1881, p. 357.

and *H. bimaculatus*; the general tendency being to a disappearance of the tropical and northern Mouse- and Dormouse-like subgenera *Rhipidomys*, *Vesperimus*, and *Oryzomys*, with the appearance and increase of the Vole- and Hamster-like *Habrothrix* and *Calomys*—a change that is curiously paralleled in the Old World by the gradual supersession of *Mus* and *Myoxus* in favour of *Arvicola* and *Cricetus*, as we go northwards from tropical to temperate and arctic regions.

As in the former paper, the measurements of a series of specimens is given in most cases; but this time in millimetres, which are used in deference to universal custom, although, in the case of small mammals, they are scarcely so convenient for practical working as the inches and tenths hitherto employed.

The species not obtained by M. Stolzmann are distinguished by an asterisk, while their number in the paper on his collection is placed after the names of those that were contained in it.

1. *HOEOCHILUS* (*NECTOMYS*) *APICALIS*, Peters. S. No. 3.

*a* to *g*. Seven immature specimens. Amable Maria and Maraynoic.

2. \**HESPEROMYS* (*RHIPIDOMYS*) *LEUCODACTYLUS*, Tsch.

*a*, *b*. Two specimens, *b* from Amable Maria, 2000 feet.

	Head and body.	Tail.	Hind foot <sup>1</sup> .	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a</i> . ♀ .....	150	198	34.5	42.5	16.5	34.0
<i>b</i> . ♀ .....	127	178	33.0	38.4	15.5	31.0
[ <i>H. latimanus</i> , Tones, ♀. 123	165	28.0	35.5	12.7	30.0]	

Skull-dimensions.

	Total length.	Basal length <sup>2</sup> .	Zygom. breadth.	Molar series.	Back of inci- sors to m <sup>1</sup> .
<i>b</i> . ....	35.8	33.2	19.5	6.9	9.2
[ <i>H. latimanus</i> . . .	34.5	32.0	18.4	5.5	8.9]

	Palatal length <sup>3</sup> .	Palatal foramen.	Interorbital constriction.	Basal axis <sup>4</sup> .	Lower jaw <sup>5</sup> .
<i>b</i> . ....	18.0	7.5	6.0	11.1	20.9
[ <i>H. latimanus</i> . . .	16.6	6.8	5.6	11.0	19.0]

Fur rather crisp, and of medium length. General colour above brownish grey, below white, the bases of all the hairs slate. Dark

<sup>1</sup> Without claws.

<sup>2</sup> From the front of the præmaxillæ to the most posterior point of either of the occipital condyles.

<sup>3</sup> From the front of the præmaxillæ to the end of the bony palate.

<sup>4</sup> From the central point of the posterior edge of the basioccipital to the anterior edge of the lower surface of the *basisphenoid* (not *presphenoid*, as accidentally stated P. Z. S. 1882, p. 65, footnote). This measurement gives the combined lengths of the basioccipital and basisphenoid, that of the *presphenoid* being unattainable unless the skull is bisected.

<sup>5</sup> Bone only.

colour of back continued down on to the metacarpals and metatarsals. Ears without a projection. Tail quite unicolor, dark brown, clothed throughout with elongated hairs, forming a distinct pencil at the tip. Feet broad, the pads very large and smooth; the proximal two so broad as to touch each other. Fifth hind toes reaching to the middle of the second phalanx of the fourth. Mammaræ six; one pectoral and two inguinal pairs. Interdental palate-ridges six.

Two specimens in the collection, undoubtedly referable to Tschudi's species, show such differences from the specimen from Huambo, named by me in 1882 *H. leucodactylus*, that I am inclined for the present to consider that, after all, Mr. Tomes's species *H. latimanus*, with which M. Stolzmann's specimen agrees, should remain as a good species, and is not synonymous with *H. leucodactylus*, as I had considered it.

Judging only from the specimens I have seen, *H. leucodactylus* may be distinguished from *H. latimanus* by its larger size (see dimensions above), especially its much larger feet, its more bushy tail, larger teeth, both absolutely and relatively (see skull-dimensions), and by the presence of six instead of five interdental palate-ridges (see Plate XLIV. figs. 6 & 7). It is of course possible that specimens will yet be found intermediate between the two forms, in which case they will again have to be united.

### 3. HESPEROMYS (ORYZOMYS) LATICEPS, Lund. S. No. 4.

*a* to *l*. Twelve specimens. Junin and Amable Maria.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a.</i> ♂ ....	127	123	30·5	37·0	17·8	30·0
<i>b.</i> ♂ ....	127	126	30·6	37·0	17·5	30·0
<i>c.</i> ♀ ....	126	125	29·0	34·0	16·5	29·8
<i>d.</i> ♀ ....	118	118	29·2	33·0	17·0	28·4

\*HESPEROMYS LATICEPS, var. NITIDUS, var. nov. (Plate XLII. fig. 1.)

*a* to *r*. Eighteen specimens, mostly young. Junin and Amable Maria.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a.</i> ♀ ....	123	149	30·9	34·0	17·8	28·4
<i>b.</i> ♀ ....	121	135	30·6	34·0	17·0	28·4
<i>c.</i> ♂ ....	118	133	31·3	34·3	17·8	27·7
<i>d.</i> ♂ ....	118	148	32·0	35·0	18·8	30·4
<i>e.</i> ♂ ....	117	135	29·9	34·0	19·0	27·4

These specimens are readily separable at sight from the ordinary *H. laticeps*, more resembling *H. albigularis*, Tomes, or *H. vulpinoides*, Schinz, in their general appearance; but a closer examination shows

that the points of difference between them and *H. laticeps* are all such as are explainable on ordinary climatic grounds, supposing that their home is hotter than the places in which *H. laticeps* ordinarily lives.

They are characterized by their dark rich rufous colour, apparently pure white bellies, though the hairs are slate-coloured at their bases, longer tails, bicolor for their proximal inch, proportionately longer hind feet, and larger ears. Their skulls are quite similar to those of the true *H. laticeps*.

In this variety we have, so to speak, the commencement of a species, which appears to be gradually becoming differentiated from another common and widely-spread form, and which will possibly in the future become more and more distinct from its parent, as the individuals representing the intermediate stages die out, until it is itself worthy to rank as a separate species.

[*HESPEROMYS (ORYZOMYS) GALAPAGOENSIS*, Waterh.]

Two skins of this species were obtained by M. Stolzmann at Tumbes in North Peru, but were not sent to me in time to be included in my account of his collection. As the occurrence of this species on the mainland has not been hitherto published, I take this opportunity of recording the fact of its presence in Peru. There are also two specimens of it in the British Museum, collected by Mr. Fraser in Ecuador.]

4. *HESPEROMYS (ORYZOMYS) LONGICAUDATUS*, Benn. S. No. 6.

*a* to *c*. Two specimens (*a* and *b*) from Amable Maria, 2000 feet, and one (*c*) without special locality.

		Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a.</i>	♀ ..	83	112	22·1	23·0	12·2	20·4
(?)	<i>c.</i> ♂.	84	100	23·0	23·6	11·0	21·0

Specimen *c* is of a much lighter colour than usual, and differs in certain other unimportant respects from ordinary *H. longicaudatus*, but may be considered for the present to represent only a pale variety of that species.

5. *HESPEROMYS (ORYZOMYS) SPINOSUS*, Thos. S. No. 7.

*a.* Amable Maria. *b.* No special locality.

		Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a.</i>	♂ ....	86	104	22·6	25·4	13·2	21·0
<i>b.</i>	♂ ....	84	97	22·4	24·6	11·6	19·8

These specimens are in every respect like the types of this interesting species, described from M. Stolzmann's collection.

6. *HESPEROMYS (CALOMYS) BIMACULATUS*, Waterh., var.  
*LEPIDUS*, var. n. (Plate XLII. fig. 2.)

a to f. Six specimens. Junin.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
a. ♂	76	34	17.0	24.0	14.5	20.8
b. ♂	77	..	17.8	24.1	14.5	20.3
c. ♂	70	38	17.5	22.3	13.7	19.0
d. ♂	68	35	16.2	..	12.5	19.8
e. ♀	71	38	17.7	22.8	14.0	20.4
f. ♀	59	33	16.2	21.0	12.2	18.0

[Co-type of <i>H. bimacula- tus</i> ♀	58	50	16.2	20.4	12.2]
--	----	----	------	------	-------

Skulls.

	Total length.	Basal length.	Zygom. breadth.	Molar series.	Inc. m <sup>l</sup> .	Palat. length.	Palat. foram.	Interorb. constr.	Basal axis.	Lower jaw.
Of b. ♂	23.9	21.9	13.5	3.6	6.0	11.9	...	4.0	7.1	13.1
e. ♀	23.1	21.2	12.7	3.6	5.8	11.2	5.0	4.0	7.1	13.0
[ <i>H. bimacula- tus</i> ..]	23.4	...	12.0	3.4	5.9	11.2	5.5	3.9	...	...

Fur remarkably long, soft and silky. General colour dull fawn, somewhat darker on the centre of the back, through the intermixture of numerous long black hairs. Fur all over the body slate-coloured for three quarters of its length, the tips of the hairs yellow on the upper surface and pure white on the belly. Feet and tail wholly snowy white.

Ears (Plate XLIV. fig. 12) very large, oval, without projection, covered inside and out with short, yellowish-brown hairs; laid forward they reach considerably beyond the anterior canthus of the eye. Tail uniformly hairy, the scales almost entirely hidden. Soles (Plate XLIV. fig. 13) hairy for their proximal two thirds, the pads small and crowded towards the distal end of the sole. Fifth hind toe (without claw) reaching to the middle of the first phalange of the fourth. Claws very small, both before and behind, almost buried in the hair on the toes. Mammary 8—two pectoral and two inguinal pairs. Interdental palate-ridges five in number.

Skull light and delicate; frontal outline markedly convex; supra-orbital edges square, but not ridged. Interparietal very narrow antero-posteriorly, but stretching right across the skull. Palatal foramen longer than molar series.

This variety may be distinguished from the true *H. bimaculatus*, Waterh.<sup>1</sup>, by its rather larger size, much longer and differently shaped ears (see Plate XLIV. figs. 12 & 14), its shorter tail, much longer fur, slate-mixed instead of pure-white belly, and by the entire absence of supraorbital ridges on its skull. Comparative measurements both of spirit-specimens and skulls are given above.

There are in the collection six specimens of this form, which is interesting as belonging to the rare and little-known subgenus

<sup>1</sup> P. Z. S. 1837, p. 10; Voy. 'Beagle,' Mamm. p. 43, pl. 12 (1839).

*Calomys* (*s. s.*), of whose subgeneric validity there can be no question, although, judged by the skull only, it might be joined with the great mass of *Hesperomyes* to which I apply the name *Oryzomys*. However, its members are so different externally from any of the other Vesper-mice (see the subgeneric diagnoses given above), that it is certainly worthy of the rank originally given it by Waterhouse. The only species belonging to it are *H. bimaculatus*, *gracilipes*, and *elegans*, to which some authors would perhaps think *H. lepidus* should be added as a distinct species; but without seeing more specimens of the true *H. bimaculatus*, I do not care to describe the present form as more than a geographical variety of that animal.

7. *HESPEROMYS* (*VESPERIMUS*) *CINEREUS*, Thos. (?) S. No. 10.

a. One specimen, Maraynioc.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
a. ♂ imm. . .	89	124	29·2	31·5	16·5	26·2

A single immature male, in a bad state, is possibly referable to this interesting species. It differs from the type, however, in having the tips of the hairs rufous instead of grey, in its even more hairy ears, and in its perfectly unicolor tail—characters often of specific importance, but not sufficient to justify the description of a new species from an immature specimen only. The skull and hind foot of the typical specimen from North Peru are figured in Plate XLIV. figs. 2-5.

8. \**HESPEROMYS* (*HABROTHRIX*) *SCALOPS*, Gay, Chili, Zool. i. p. 108 (1847). (Plates XLIII. fig. 1, and XLIV. figs. 1, 15, and 16.)

Nine specimens: *a* to *g*, Junin; *h* and *i*, Maraynioc.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
a. ♀ . . . .	112	76	21·6	28·2	15·5	26·5
b. ♀ . . . .	104	76	21·3	27·3	13·0	25·2
c. ♀ . . . .	100	74	21·6	27·3	13·4	24·1
d. ♂ . . . .	98	61	21·3	27·9	14·5	24·0
e. ♂ . . . .	93	67	21·8	27·9	14·5	23·4
h. ♂ . . . .	92	71	21·8	27·3	14·5	24·0

Skull-dimensions.

	Total length.	Basal length.	Zygom. br.	Molar series.	Inc. to ml.	Palat. length.	Palat. Interorb. foram. constr.	Basal Lower axis. jaw.		
Skull of <i>e.</i> ...	28·1	26·0	14·0	3·8	7·4	12·7	6·1	4·6	8·3	15·2

Fur soft, of medium length. General colour dark grey, tinged on the back with chestnut. Muzzle and face, ears, feet, and lower side of tail rich rufous, forming a marked contrast to the general grey colour. Ears thickly haired, rather narrow, without a projection; laid forward they just reach to the centre of the eye. Tail hairy, bicolor, dark brown with a tinge of chestnut above, pale rufous-yellow below. Belly dull grey. Soles naked, flesh-coloured,

the pads large and prominent. Thumb with a large and prominent nail, but not a claw. Other fingers with very long claws, 4 to 5 millim. in length. Fifth hind toe, without claw, reaching to the middle of the first phalanx of the fourth. Mammaræ 8, two pectoral and two inguinal pairs.

Skull rather narrow; upper margin of the orbit rounded, quite without ridges; interparietal remarkably small, only 4 millim. in breadth and  $1\frac{1}{2}$  in an antero-posterior direction. Incisive foramina reaching to the first fold of the anterior molars. Incisors pale yellow above, nearly white below. Muzzle rather long and low, only 4.2 millim. in height at the anterior end of the palatine foramina. Lower jaw very thin and slender, only 7 millim. from the top of the coronoid to the tip of the angular process. Coronoid higher than condyles.

This species seems to be a house-haunting one, as the two Maraynioc specimens are labelled by M. Jelski as domestic Mice.

Gay's specimen had a tail only 50 millim. in length, but his description of the coloration is too exact to admit any doubt that the present is really his species.

*H. scalops*, owing to its elongated claws, was placed in the subgenus *Oryzomys* by its describer, but, just as in the case of *H. megalonyx*, Waterh., the skull proves it to belong to *Habrothrix*, of which it is by far the most brightly marked member.

#### 9. *H. (HABROTHRIX) OLIVACEUS*, Waterh. S. No. 12.

*a, b.* Two specimens. Maraynioc.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a. ♂</i> ....	81	74	19.8	24.0	12.7	22.8
<i>b. ♂</i> ....	86	89	20.5	25.6	15.2	22.9

These two specimens, like those, quite similar, collected by M. Stolzmann, I refer to *H. olivaceus*; but larger series from different localities are needed before the exact relations between *H. olivaceus*, *arenicola*, *obscurus*, *caliginosus*, and the other Vole-like Vesper-mice of the Patagonian subregion can be properly made out.

#### 10. *H. (HABROTHRIX) CALIGINOSUS*, Tomes (?). S. No. 13.

*a to m.* Thirteen specimens. Junin and Amable-Maria.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a. ♂</i> ....	108	82	23.1	28.1	15.5	25.9
<i>b. ♂</i> ....	105	84	22.3	27.9	15.7	25.6
<i>c. ♂</i> ....	104	—	22.6	27.9	14.5	26.1
<i>d. ♀</i> ....	102	82	21.6	26.9	14.5	24.1

In 1882 I placed, with considerable doubt, some specimens under Mr. Tomes's *H. caliginosus*, and in the same way I now refer these specimens, which are quite identical with those of M. Stolzmann,

to that species. It should, however, be noted that there is in the Museum collection a species, represented by three specimens, agreeing *externally* quite as well as these with Mr. Tomes's description, but whose skull is wholly different, and proves it to belong to the subgenus *Oryzomys*. To which of these two species therefore the name *caliginosus* is really referable is a question which can only be settled by an examination of Mr. Tomes's type.

11. \* *HESPEROMYS (HABROTHRIX) XANTHORHINUS*, Waterh.

*a* to *c*. Three specimens. Junin.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a. ♂</i> . . . . .	76	57	17·8	22·6	10·5	20·0
<i>b. ♂</i> . . . . .	75	57	17·7	21·8	11·5	20·5
<i>c. ♀</i> . . . . .	73	57	17·7	21·3	12·0	19·4

This is the most northern locality yet recorded for *H. xanthorhinus*, which has been hitherto only obtained from Chili and Southern Patagonia.

12. \* *RHEITHRODON PICTUS*, sp. n. (Plate XLIII. fig. 2.)

*a* to *k*. Eleven specimens. All from Junin.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear- conch.	Muzzle to ear.
<i>a. ♀</i> . . . . .	121	91	25·1	34·0	21·4	29·9
<i>b. ♀</i> . . . . .	109	89	24·1	29·7	19·5	28·5
<i>c. ♂</i> . . . . .	109	88	24·3	31·0	18·3	28·0
<i>d. ♂</i> . . . . .	108	91	26·6	33·0	18·3	26·6
<i>e. ♂</i> . . . . .	108	90	24·9	31·6	18·8	27·8
<i>f. ♂</i> . . . . .	107	90	25·4	29·9	20·4	26·6
<i>g. ♂</i> . . . . .	103	91	25·4	30·6	19·0	27·9
<i>h. ♂</i> . . . . .	102	82	25·3	29·4	19·3	25·4
<i>i. ♂</i> . . . . .	( <i>c</i> )100 <sup>1</sup>	75	24·1	29·0	18·8	—

Skull-dimensions.

	Total length.	Basal length.	Zygomatic breadth.	Molar series.	Inc. to m <sup>l</sup> .
<i>Of i. ♂</i> . . . . .	28·0	26·5	17·0	5·6	7·1
	Palatal length.	Palatal foramen.	Interorbital constriction.	Basal axis.	Lower jaw.
	14·7	7·0	4·1	8·6	17·2

Fur long, soft and silky, with very numerous longer black or grey hairs intermixed. Upper side of head and neck clear grey, the hairs slate-coloured for seven eighths of their length, then whitish, with their extreme tips black. This grey gradually becomes darker and more grizzled on the shoulders, while on the back the white of the hairs gradually becomes more and more rufous until the rump is

<sup>1</sup> Skull out.

a rich bright chestnut-colour. Belly hairs slate-coloured, with pure white tips. Feet pure white. Tail thickly haired, though not pencilled, sharply bicolor, dark brown above, and pure white on the sides and below. Ears thickly covered with shining yellowish grey hairs. An inconspicuous white spot both above and below the base of each ear.

Ears large and rounded; laid forward they just cover the eyes; no projection on the anterior margin. Feet slender; the fourth toe the longest, fifth barely reaching to the end of the first phalanx of the fourth; soles naked; foot-pads smaller and more prominent than in *R. chinchilloides*. Mammæ 8—two pectoral and two inguinal pairs. Interdental palate-ridges 5; smooth posterior palate commencing between the second and third molars.

Skull (Plate XLIV. figs. 20 & 21) with the essential characters of that of *R. chinchilloides*, but the frontal outline less arched, the nasals shorter and narrower, and the interparietal narrower from before backwards. Upper edge of orbit not beaded. Anterior palatine foramen reaching to opposite the second projection of *m*<sup>1</sup>.

The nearest ally of this species is of course *R. chinchilloides*, Waterh., from which it may be distinguished by its larger ears, slenderer feet, and wholly different coloration, while of the true *Hesperomyes*, *H. xanthopygus*, Waterh., agrees most nearly in colour and proportions with it, but may be readily distinguished by its plainer colour, narrow convex teeth, and much longer tail.

#### EXPLANATION OF THE PLATES.

##### PLATE XLII.

- Fig. 1. *Hesperomys laticeps*, var. *nitidus*, p. 452.  
2. *H. bimaculatus*, var. *lepidus*, p. 454.

##### PLATE XLIII.

- Fig. 1. *H. scalops*, p. 455.  
2. *Rheithrodon pictus*, p. 457.

##### PLATE XLIV.

- Fig. 1. Palate of *Hesperomys scalops*.  
2-5. Skull and hind-foot of *H. cinereus*.  
6. Palate of *H. latimanus*, p. 452.  
7-9. Palate, skull, and hind foot of *H. leucodactylus*, p. 452.  
10-13. Skull, hind foot, and ear of *H. bimaculatus*, var. *lepidus*, p. 454.  
14. Ear of *H. bimaculatus*, typ. var., p. 454.  
15-16. Skull of *H. scalops*, p. 455.  
17-18. Skull of *H. spinosus*, p. 453.  
19-21. Hind foot and skull of *Rheithrodon pictus*, p. 457.

#### 11. On the Rhynchota collected by the late Mr. W. A. Forbes on the Lower Niger. By W. L. DISTANT.

[Received June 17, 1884.]

The small Rhynchotal portion of the Entomological collection made by the late Mr. W. A. Forbes on the Lower Niger having been placed in my hands for identification, with a request that I

would give the results to this Society, I now do myself the honour to present the same.

The collection consists of examples of twelve species, eleven of which belong to the Heteroptera and one to the Homoptera. Of the first, two species appear to be undescribed, and for the reception of one I have been compelled to propose a new genus. With these two exceptions all are well-known species described by old authors, no less than five having been described by Fabricius; whilst the names of Linnaeus, Thunberg, and Klug attached to remaining species sufficiently testify that we are dealing with insects of well-known and abundant character.

The peculiarities of their geographical distribution I have appended to the identifications of the species.

## HETEROPTERA.

### Fam. PENTATOMIDÆ.

1. *STEGANOCERUS MULTIPUNCTATUS*, Thunb., var. C, Stål, Hem. Afr. i. p. 51 (1864).

This appears to be the only variety of this protean species found in West Africa, and is the first example I have myself seen from that subregion, though Dr. Stål recorded it (on the authority of specimens so labelled in Dr. Signoret's collection) as from Calabar. It is not, however, confined to West Africa, but, like the other varieties of the species, is widely distributed. In my own collection are specimens collected in various parts of Southern Africa, and also from the Nyassa and Mombas districts in the east.

2. *SPHEROCORIS OCELLATUS*, Klug.

This, again, is the first example of the species I have received from West Africa, though it is found in Caffraria (Stål), is not uncommon in Eastern Africa (my own habitats being Nyassa and Mywapwa), and is also recorded from Abyssinia.

3. *CIMEX (AFRIUS) PURPUREUS*, Westw.

Var. *marginella*, Dall. List Hem. i. p. 89, n. 3 (1851).

This variety was first described by Mr. Dallas from Sierra Leone. The specimen collected by Mr. Forbes is the only other example I have received from West Africa, to which the species seems confined, though it apparently does not reach the southern and eastern limit of Calabar.

4. *SEPHELA LINEARIS*, A. & S.

A West-African species, described originally from Senegal, but which I have also received from the Cameroon district.

### AGABOTUS, gen. nov.

Body oval, somewhat depressed. Head with the lateral margins amplified, laminate and somewhat curved upwards, the lateral lobes longer than the central lobe, meeting beyond it, their apices rounded, but sinuately cleft; ocelli situate some distance from and

behind the eyes. Rostrum reaching the intermediate coxæ; basal joint not quite so long as the head, second and third joints subequal in length. Antennæ hirsute, with the basal joint stoutest and about reaching the apex of head; second joint slightly shorter than the third. Pronotum with the lateral margins slightly amplified, laminate and recurved, the anterior angles obscurely spined, the posterior angles somewhat rounded; the disk from about centre to base of head obliquely depressed, the anterior margin concavely excavated to receive head. Scutellum somewhat elongate, narrowed before apex, which is obtusely rounded and extends a little beyond inner angle of corium. Corium not covering abdominal margin except at base. Membrane not quite reaching abdominal apex in the female, in the male reaching the abdominal extremity; the veins simple and longitudinal. Mesosternum with a slight central carination. Legs moderately long and pilose; femora unarmed; tibiæ sulcated above.

This genus appears to find its systematic position between *Caystrus*, Stål, and *Anarropa*, Gerst., both of which are also Tropical-African genera.

5. *AGABOTUS BRUNNESCENS*, n. sp.

Ochraceous, thickly covered with dark-brown punctures. Eyes black, their basal margins ochraceous; ocelli pale castaneous. Antennæ pale ochraceous, prominently hirsute; second joint slightly shorter than the third, fourth and fifth subequal in length, base of the fifth sometimes much paler in hue. Corium with the veins pale ochraceous, and the costal area much less punctate. Membrane pale fuscous, with a pitchy spot at each side of base. Connexivum ochraceous, thickly covered with dark and very fine punctures, the outer margin impunctate, with a small black spot at each sutural apex. Head beneath and sternum ochraceous, thickly covered with dark punctures; disks of meso- and metasternums pitchy. Abdomen pitchy-brown or black, thickly and finely punctate, the disk sometimes paler and the lateral margins broadly ochraceous, with a small black spot at each sutural apex. Rostrum ochraceous, with its apex pitchy.

Long. 12 to 13 millim.

6. *ÆTHEMENES FORBESI*, n. sp.

Body above bright grassy-green; eyes, apex of third and the whole of fourth and fifth joints of antennæ blackish; central lobe of head and base of pronotum rather darker greenish; membrane pale hyaline. Body beneath green; disk of the abdomen ochraceous. Rostrum green, with its extreme apex fuscous.

Antennæ with the second joint longer than the third, fourth subequal to, or very slightly longer than, the fifth; head thickly and finely punctate; pronotum somewhat coarsely punctate and subrugulose on basal half; scutellum and corium thickly and somewhat finely punctate.

Long. 9 millim.

This species is apparently most closely allied to *Æ. nigro-punctatus*, Sign.

## Subfam. DINIDORINÆ.

7. *ASPONGOPUS VIDUATUS*, Fabr.

A species found alike in West, South, and East Africa; Stål also records it from Nubia, and gives the further habitats of "Syria, Turcia."

## Subfam. PHYLLOCEPHALINÆ.

8. *DALSIRA MODESTA*, Fabr.

This species has hitherto been recorded from the Congo, Gaboon, and Senegal. A closely allied and scarcely separable species?, *D. affinis*, A. & S., is found in South Africa.

## Fam. COREIDÆ.

## Subfam. COREINÆ.

9. *ANOFLOCNEMIS CURVIPES*, Fabr.

It is probable that this common species is found throughout the length and breadth of the Ethiopian region.

## Fam. PYRRHOCORIDÆ.

## Subfam. PYRRHOCORINÆ.

10. *DYSDERCUS SUPERSTITIOSUS*, Fabr.

A common tropical African species, and abundant both on the East and West coasts.

## Fam. REDUVIIDÆ.

## Subfam. ACANTHASPIDINÆ.

11. *PLATYMERIS BIGUTTATA*, Linn.

Previously recorded from Senegal and Sierra Leone.

## HOMOPTERA.

## Fam. CERCOPIDÆ.

## Subfam. CERCOPINÆ.

12. *LOCRIIS RUBRA*, Fabr.

This species has hitherto being only recorded as from Senegal.

12. On the Development of the Individual and of the Species as Forms of Instinctive Action. By ST. GEORGE MIVART, V.P.Z.S., Ph.D., M.D., F.R.S.

[Received June 17, 1884.]

The object of this paper is to endeavour to show that the clearest comprehension of Ontogeny and Phylogeny is probably to be obtained by regarding them as special forms of Instinctive Action. In order to make this conception intelligible, it is necessary to begin by considering "Instinct" itself.

Instinct has been very generally considered to be an altogether peculiar phenomenon, very distinct from all the other powers possessed by animals. Attempts have, however, been made to explain it by "reflex action" on the one hand, and by "conscious deliberate intelligence" on the other. It has by some persons been regarded as "compound reflex action" in which sensation intervenes. It has by other persons been considered as made up of the relics and remains of intelligent acts, which acts were once performed with deliberate purpose and intention, but which have become so extremely habitual as, at length, to be performed without the intervention of any consciously intelligent purpose on the part of the creatures which perform them.

To appreciate fully the bearing of Instinct on Ontogeny and Phylogeny, we should also see what are its relations to the other vital processes—such as reflex action and the repair and reproduction of lost parts after injury. Before entering upon this question, however (the question of the relations existing between Instinct and the various other vital processes), it will be well to start with a declaration as to what is meant by the term Instinct in the present paper.

The general notion of "Instinct" is that of a special, internal "impulse urging animals to the performance of certain actions which are useful to them or to their kind, but the use of which they do not themselves perceive, and their performance of which is a necessary consequence of their being placed in certain circumstances"<sup>1</sup>. Such actions can, however, only be considered as being generally useful—useful in the great majority of instances, as Instinct every now and then impels animals to perform an act prejudicial to the individual performing it in some particular case.

That we may securely proceed from the more known to the less known, it will be best to begin with a consideration of Instinct<sup>2</sup> as it exists in Man; since we can know no creatures so well as we can, by the help of language and reflection, know ourselves and our own species.

<sup>1</sup> Todd's Cyclopædia, vol. iii. p. 3.

<sup>2</sup> "Instinct" as such (like "life," "mind," &c.) is, of course, a pure abstraction, and exists thus only in our minds, though it has a real existence enough, in certain concrete actions which animals perform.

As every object of study is made clearer by contrasting it with other objects distinct in kind from it, so our "instinctive actions" may be more clearly apprehended by contrasting them with such of our actions as are said not to be "instinctive." But we habitually contrast "Instinct" with "Reason." What, then, are the characters which distinguish actions which are attributed to "Reason"? Now "reasonable," "consciously intelligent" conduct, is understood by all men to mean conduct in which there is a more or less wise adaptation of means to ends—a deliberate adaptation, not one due to accident only. No one would call an act done blindly a reasonable intelligent action on the part of him who did it, however fortunate might be its result. Our highest mental activity, our type of reason, consists of conscious, deliberate, intellectual perceptions—explicit judgments—and our reasonable actions are actions performed in accordance therewith.

But besides these actions due to our self-conscious intellect, there are a variety of other actions—such *e. g.* as our respiratory actions—which we ordinarily perform without advertence, though we can, if we will, perform them with self-conscious deliberation. Again, we may, when our mind is entirely directed upon some external object, or when we are almost in a state of somnolent unconsciousness, have but a vague feeling of our existence—a feeling resulting from the unobserved synthesis of our sensations of all orders and degrees. This unintellectual sense of self may be conveniently distinguished from intellectual "*Consciousness*" as "*Consentience*."<sup>1</sup>

Nothing is more common with us than to experience modifications of our organs of sense to which our intellect in no way adverts. Such modifications constantly influence our actions (as in walking and running) without our ever adverting to them, either at the time of their occurrence or afterwards. We may also, as everybody knows, suddenly recollect sights or sounds which were quite unnoticed at the time we experienced them; yet our very recollection of them proves that they must, nevertheless, have affected our sensorium. Such unnoticed modifications of our sense-organs may, at least provisionally, be called "unfelt sensations."

According to our preliminary definition and according to general usage, actions, whether adverted to or not, cannot be called "instinctive" unless they are generally useful ones directed to the accomplishment of unforeseen ends. But it is a familiar fact that we often perform such actions. As examples of the kind may be enumerated:—spontaneous, instantaneous actions directed to the warding off of a blow or to the due maintaining of the body's balance. Who also has not experienced how much better such actions are performed (as *e. g.* the action of running up stairs) with the mere aid of consentience, than when our intellect is brought to bear upon our motions?

The little boy as yet unable, or hardly able to speak, has no expectation of future encounters when he begins unconsciously to grasp at weapons; and long before the little girl can represent to

<sup>1</sup> A term I believe first introduced by the late Mr. G. H. Lewes.

herself future tributes to her charms, she seeks to decorate her tiny body with the arts of infant coquetry. Still less does she look forward to the pains and pleasures of maternity, when she begins to caress and chastise, to soothe and cherish her first doll, and fondly presses it to that region whence her future offspring will draw its nourishment.

Again, when—the lapse of a few years having made her a young woman and the boy a youth—they first feel the influence of love, however ignorant they may be of the physiology of their race, they will none the less, circumstances permitting, be surely impelled towards the performance of very definite actions. In the more refined individuals of the highest races of mankind, the material element is most certainly far from being the one great end distinctly looked forward to by each pair of lovers. Yet every incident of affectionate intercourse infallibly leads on towards the one end, useful to the race, which nature has in view. Such actions fully merit to be called “instinctive.”

That animals even of the higher classes do perform actions which are truly instinctive is generally admitted by naturalists. Mr. Wallace, indeed, believes that Birds learn to build their nests by observing the structure of those in which they themselves are reared. I have not found this view to be shared by other naturalists of my acquaintance; and, in spite of the deference and respect due to so eminent an observer and so lucid a reasoner as my friend Mr. Wallace, it seems to me a view which is untenable. Some of the nests which require an especial skill in their construction are those which are suspended and entirely enclosed save at one small aperture. How the young within such a nest can, by observation, learn to form it, is to me inconceivable.

It is, however, the instincts of Insects which are the most wonderful, and these are so numerous and so notorious that only one or two instances at most need here be referred to, such as those of the Carpenter Bee, the Wasp *Spheex*, and the larval Stag-Beetle, the male of which, it is said, digs a hole, for its transformation, twice as big as his own body (to allow for the development of his enormous mandibles), while the female only digs one of her own size.

Even more wonderful than the instincts of insects, are the actions of those Rhizopods which, as Dr. Carpenter affirms<sup>1</sup>, build up tests or casings of the most regular geometrical symmetry of form, and of the most artificial construction. “From the very same sandy bottom, one series picks up the coarser quartz grains, cements them together with phosphate of iron secreted from its own substance, and thus constructs a flask-shaped test having a short neck and a single large orifice. Another picks up the finest grains and puts them together with the same cement into perfectly spherical tests of the most extraordinary finish, perforated with numerous small pores at regular intervals. Another selects the minutest sand-grains and the terminal portions of sponge-spicules, and works these up together—apparently with no cement at all, by the mere laying of the

<sup>1</sup> ‘Mental Physiology,’ p. 41.

spicules—into perfect white spheres, each having a single fissured orifice. Another (which makes a many-chambered test like the shell of an Orthoceratite, the conical mouth of each chamber projecting into the cavity of the next), while forming the walls of its chambers of ordinary sand-grains rather loosely held together, shapes the conical mouths of its successive chambers by firmly cementing together grains of ferruginous quartz, which it must have picked out from the general mass." On considering such remarkable differences in action, between creatures of structures so simple and so similar, the question naturally arises, "May not the differences be due to diversities of molecular structure?" That structural differences which our senses cannot detect, exist not only between all the kinds, but also between all the individuals, is what no one can reasonably deny; but as such differences cannot be known by observation, whereas the differences of habit can be so known, an attempt to explain the latter by the power would be to explain *obscurum per obscurius*. Moreover, it is very difficult to see how such molecular difference alone, can govern the shape and ornamentation of the flask which a particle of protoplasm constructs to shelter its own amorphous substance. Moreover Mr. Carter has recorded<sup>1</sup> observations with regard to actions of other Rhizopods which at the least have much appearance of being instinctive. There are also actions performed by animals not so very much higher in the scale—certain *Coelentera* and *Echinoderma*<sup>2</sup>, which must I think be allowed to be instinctive by all who hold that Instinct is generally beneficial vital action in which sensation intervenes. That sensation, in some form, does intervene in these animals, is, in my opinion, so far shown by the possession of a distinct nervous system, that we may assume it in the absence of any good reason to the contrary being brought forward.

When a nervous system, however, does not exist, we cannot venture to assert the presence of any true sensation. The, at least seemingly, instinctive actions in the lowest animals may then serve to introduce to our consideration certain actions in ourselves and in other animals which are not generally reckoned as "instinctive."

Before, however, proceeding to their consideration, I would say a few words on the subject of "lapsed intelligence." I am strongly persuaded that "lapsed intelligence" will not explain "Instinct" generally, but I should be the last to deny that certain instinctive actions may be so explained, and I fully admit that intelligent action in ourselves does tend to become instinctive. It is also fortunate for us that it does so tend, as thereby we are saved great mental friction, and our intelligence is, as it were, set free to appropriate and render instinctive a continually wider and more important range of deliberate, purposive actions.

That such "lapsed intelligence" will not, however, explain *all* instinctive actions, seems to me clear from a consideration both of the lowest, or most simple, instinctive actions on the part of ourselves

<sup>1</sup> Ann. of Nat. Hist. 3rd series, 1863.

<sup>2</sup> See 'Animal Intelligence,' by G. J. Romanes, pp. 22, 23.

and other animals, and also of our own highest and most complex instinctive actions.

I will now revert to the consideration of certain actions, in ourselves and other animals, which actions are not generally reckoned as "instinctive." The characters presented by the actions of the lowest animals may serve as an introduction to them.

In the first place let us glance at those actions which are termed "reflex." Herein it is commonly supposed that the living mechanism occasions a prompt responsive muscular action upon the occurrence of some unfelt nerve-stimulation. The best-known examples are the appropriate actions, in response to stimuli, performed by a decapitated Frog, and those which the lower limbs of a Man may execute when the nerves of his feet are stimulated after his spinal cord has been so injured that he has lost all power of sensation in his inferior extremities. It has been objected by the late Mr. G. H. Lewes and others that we cannot be sure but that the spinal cord itself "feels." But there is often an ambiguity in the use of the term "to feel." By it we ordinarily mean a "modification of consciousness," but experiences such as those before adverted to, and which I have provisionally called "unfelt sensations," show clearly that effects may be produced by surrounding agents on our sense-organs without the intervention of consciousness, similar to those produced on them when they *do* arouse consciousness. Without then entering into any discussion as to whether "sentiency" may or may not be attributed to the spinal cord, it seems evident that some definite term is required to denote those modifications of our being which have here been provisionally termed "unfelt sensations."

It is obviously very difficult, probably impossible, to draw any hard and fast line between reflex action, unfelt sentiency, and such unconscious, instinctive impulses as have been above referred to in speaking of Instinct in man.

There is also another class of organic vital actions which seem to have a certain affinity both to reflex action (from their perfect unconsciousness) and to Instinct, from their being directed towards a useful but unforeseen end. The class of actions here referred to are those which relate to the repair of injuries and the reproduction of lost parts.

In a process of healing after a wound, a true secretion is poured forth of intercellular substance in which cells are abundantly formed, and, by a process of transformation, vessels, tendons, nerves, bone, and membrane all arise, as they originally first arose in the embryo, from undifferentiated cellular substance.

In a case of broken bone, the two broken ends soften and a substance is secreted which becomes at first gelatinous, often afterwards cartilaginous, and finally, osseous.

But not only distinct tissues, but very complex teleological structures, such as admirably formed joints, may be reproduced. Thus we read<sup>1</sup> that "a very interesting example is recorded by Mr. Syme, in which he had the opportunity of dissecting the new joint,

<sup>1</sup> See Mr. Timothy Holmes's 'System of Surgery,' 3rd edition, vol. iii. p. 746.

nine years after the operation (excision of the elbow) which had been performed on account of injury—the man having in the interval acted as guard on a railway, swinging himself from one carriage to another while the train was in motion, with the injured arm, quite as easily and securely as with the other. The ulna was found united to the humerus by ligament; the end of the radius was polished off, and played on the humerus and on the ulna, a material something like cartilage being interposed. The ends of the bones of the forearm were locked in by two processes projecting downwards from the humerus, and strong lateral, and still stronger anterior and posterior ligaments, also bound them to the latter bone.” It would be easy to bring forward a great number of more or less similar cases.

The amount of reproduction of lost parts of which many of the lower animals are capable every naturalist knows. It is also a notorious and very noteworthy fact that in both man and the lower animals, the processes of repair take place the more readily the younger the age of the injured individual may be. But these unconscious but practically teleological processes of repair are often preceded by actions which *every one* would call instinctive. The actions here referred to are such as the throwing off (by a Lobster, Crab, or Spider) of an injured limb in order that by its separation at a suitable spot its reproduction may be brought about. But this spontaneous removal of the limb is only the first act, and a necessary act, of the process of its reproduction. It is (as has been observed by Hartmann<sup>1</sup>) analogous to the reproduction, by a larva, of its injured cocoon, or by a Spider of its torn net. They are all reparative actions accompanied by feelings of different degrees.

A consideration of the process of remedial reproduction in the individual, naturally leads us on to the consideration of *the reproduction of the individual itself*.

It would be a quite superfluous task here to make more than a general reference to the wonderful series of changes which each embryo of a *Hydra tuba*, an *Echinus*, a *Sepia*, a Butterfly, a Batrachian, and a Man goes through during its individual process of development, or ontogeny.

This process, in its perfect unconsciousness, is like reflex action, but it is far more wonderful, since in the earliest stages even nerve-tissue is absent and has itself to be formed. In the accuracy of its direction towards a useful end, it is the very counterpart of the most developed Instinct; nor, if the impulses by which adult individuals are led to seek and to perform those processes which give rise to the embryo are to be called instinctive, is it easy to see how the term “instinctive” can be refused to that impulse by which each developing embryo is led to go through those processes which give rise to the adult.

Can these analogies be carried further still, and can we, from the consideration of Instinct in the widest sense of that term, throw any

<sup>1</sup> I would refer my hearers to E. von Hartmann's work on ‘The Unconscious,’ which they will find very suggestive, and to which I gladly acknowledge many obligations, as regards my treatment of this subject.

glimmerings of light upon that most recondite and still most mysterious process, *the genesis of new species*?

We may be encouraged to hope that such a result is possible from the words of one of those twin Biologists who on the same night put forth their independently arrived-at views as to what we are all agreed to regard as at least an important factor in the Origin of Species. No less a person than Mr. Wallace has written the following significant words<sup>1</sup>:—

“No thoughtful person can contemplate without amazement the phenomena presented by the development of animals. We see the most diverse forms—a Mollusk, a Frog, and a Mammal—arising from apparently identical primitive cells, and progressing for a time by very similar initial changes, but thereafter each pursuing its highly complex and often circuitous course of development, with unerring certainty, by means of laws and forces of which we are totally ignorant. It is surely a not improbable supposition that the unknown power which determines and regulates this marvellous process may also determine the initiation of these more important changes of structure, and those developments of new parts and organs which characterize the successive stages of the evolutions of animal forms.”

These words advocate and confirm what I have elsewhere<sup>2</sup> antecedently urged.

Many influences doubtless may come into play in the origin of new species; but let us look a little narrowly at certain influences which *must* come into play therein, and the action of which no man can deny.

One of these influences (which no one has more richly illustrated than has the late Mr. Darwin) is that of Heredity; but, what *is* heredity?

In the first place it is obviously a property, not of new individuals—not of offspring—but of parental forms. As every one knows, it is the innate tendency which each organism possesses to reproduce its like. If any living creature, X, was self-impregnating and the outcome of a long line of self-impregnating predecessors, all existing in the midst of one uniform and continuously unvarying environment, then X would produce offspring completely like itself. This fundamental biological law of reproduction may be compared with the physical first law of motion<sup>3</sup>,—*according to which any body in motion will continue to move on uniformly at the same rate and in the same direction until some other force or motion is impressed upon it.*

The fact that new individual organisms arise from both a paternal and a maternal influence, and from a line of ancestors every one of which had a similar bifold origin, modifies this first law of heredity only so far as to produce a more or less complex compound of hereditary reproductive tendencies in every individual; the effect of which must be analogous to that mechanical law of the composition of

<sup>1</sup> In the ‘Nineteenth Century,’ Jan. 1880, p. 96.

<sup>2</sup> ‘Genesis of Species,’ Macmillan, 1871.

<sup>3</sup> My attention was called to this analogy by my friend Dr. Gasquet.

forces resulting in the production of a new creature resembling its immediate and more remote progenitors, in varying degrees, according to (1) the amount of force springing from each ancestral strain, and (2) the compatibility or incompatibility<sup>1</sup> of the prevailing tendencies—resulting in an intensification, perpetuation, modification, or neutralization of ancestral characters, as the case may be.

All such action is but “heredity” acting in one or other mode; but there is another, and fundamentally different, action which has to be considered, and that is the action of the environment upon nascent organisms—an action exercised either directly upon them, or indirectly upon them through its direct action upon their parents. That such actions produce unmistakable effects is notorious. It will be, I think, sufficient here to advert to such cases as the well-known brood-mare covered by a quagga, and the peculiar effects of a well-bred bitch being lined by a mongrel. These show how an action exercised upon the female parent (but with no direct action on the immediate offspring) may act indirectly upon her subsequent progeny.

As a rule, modifications accidentally or artificially induced in parents are not transmitted to their offspring; as is well shown by the need of the repetition of circumcision, and of pressure of Indian children’s heads and Chinese girls’ feet in each generation. Yet there is good evidence that such changes are occasionally inherited. The epileptic offspring of injured Guinea-pigs is a case often referred to. Hæckel speaks of a Bull which had lost its tail by accident and which begot entirely tailless calves. With respect to Cats<sup>2</sup> I am indebted to Mr. John Birkett for the knowledge of an instance in which a female with an injured tail produced some stump-tailed kittens in two litters.

There is evidence that certain variations are more apt to be inherited than others. Amongst those very apt to be inherited are skin affections, affections of the nervous system and of the generative organs, *e. g.* hypospadias and absence of the uterus. The last case is one especially interesting, because it can only be propagated indirectly.

Changes in the environment notoriously produce changes in certain cases even in adults. The modifications which may result from the action of unusual agencies on the embryo have been well shown by M. C. Dareste<sup>3</sup>. As has been already remarked, processes of repair take place the more readily the younger the age of the subject. Similarly it is probable that the action of the environment generally acts more promptly and intensely on the embryo than in the older young. That the same organism will sometimes assume

<sup>1</sup> Mr. Darwin tells us that two topknotted Canaries produce bald offspring, due probably to some conflicting actions analogous to the interference of light.

<sup>2</sup> See ‘The Cat’ (John Murray, 1881), p. 7.

<sup>3</sup> See ‘Archives de Zool. expér.’ vol. ii. p. 414, vol. v. p. 174, vol. vi. p. 31, also Ann. des Sci. Nat. 4 série, Zoologie, vol. iii. p. 119, vol. xv. p. 1, vol. xvii. p. 243; and his work ‘Recherches sur la production artificielle des Monstruosités ou essais de Tératogénie expérimentale.’

very different forms has been shown by Professor Lankester in the very interesting case of *Bacterium rufescens*<sup>1</sup>.

It is also obvious that the very same influences (*e. g.* amounts of light, heat, moisture, &c.) will produce different effects in different species, as also that the nature of some species is more stubborn and less prone to variation than that of others. Such for example is the case with the Ass, the Guinea-fowl, and the Goose as compared with the Dog, the Horse, the Domestic Fowl, and the Pigeon. Thus both the amount and the kind of variability differ in different races, and such constitutional capacities, or incapacities, tend to be inherited by their derivative forms, and so every kind of animal must have its own inherent powers of modifiability, or resistance, so that no organism or race of organisms *can* vary in an absolutely indefinite manner; and if so, then unlimited variability must be a thing absolutely impossible.

The foregoing considerations tend to show that every variation is a function<sup>2</sup> of "heredity" and "external influence"—*i. e.* is the result of the reaction of the special nature of each organism upon the stimuli of its environment.

In addition to the action of heredity and the action of the environment, there is also a peculiar kind of action due to an internal force which has brought about so many interesting cases of serial and lateral homology which cannot be due to descent<sup>3</sup>, but which demonstrate the existence of an intra-organic activity, the laws of which have yet to be investigated. Comparative anatomy, pathology, and teratology combine to point out the action of this internal force.

As to its action as exemplified in the homologies of the Crustacea Mr. Brooks<sup>4</sup> makes the following remarks:—

"Special homology may be defined in two ways, morphologically and phylogenetically.

"From the morphological point of view an homology is a similarity in essential plan of structure, which may be obscured by differences due to diversity of function.

"From the phylogenetic point of view it is a resemblance which is due to community of origin or heredity from a common ancestor. . . .

"Now are the phenomena of serial and lateral homology like those of special homology in this second or phylogenetic sense, as well as in a morphological sense?

"On the assumption that the remote ancestor of the Crustacea was a community of independent organisms, all of which had inherited their organization from the same parent, we might answer that serial homology is like special homology when viewed from a phylogenetic standpoint; and if we assume that this series was at

<sup>1</sup> See 'Quarterly Journal of Microsc. Sci.' new series (1873), vol. xiii. p. 408, and vol. xvi. (1876), p. 27.

<sup>2</sup> In the mathematical sense of the word.

<sup>3</sup> Such *e. g.* as some of those noticed by me in a paper on the Fins of Elasmobranchs, Trans. Zool. Soc. vol. x. p. 439.

<sup>4</sup> W. K. Brooks in Phil. Trans. 1882; 'A Study of Morphology,' p. 57; and Serial Homology and Bilateral Symmetry in Crustacea,' p. 125.

first double, and that the progress of centralization suppressed one side of each metamere as the community became gradually fused into a bilateral organism, we may make the same statement regarding symmetry.

"A process of evolution of this sort is not impossible . . . The Salpa-chain is a bilateral community, and in *Doliolum* we have a similar community which exhibits considerable polymorphism. If this process were carried a little further, we might ultimately have a bilaterally symmetrical organism in which corresponding parts in the series or on opposite sides should be strictly homologous by descent; but we are not therefore justified in assuming that all instances of serial and lateral homology have originated in this way, and even if we were, a more careful analysis will show that the assumption does not remove all the difficulties.

If we grant, for the sake of argument, that the Crustacea are not the descendants of *Nauplius*, but of a remote ancestor which consisted of a community of independent metameres, we shall still be forced to recognize a bond of relationship between the limbs of a Decapod, which is very much more recent than that which they owe to common descent from the parent of the group of Zooids which formed the ancestral community.

"The first, second, and third thoracic limbs of the adult *Lucifer* agree with each other, or are homologous, in certain features which are not present in a Schizopod. The exopodite is absent and the endopodite is long and slender in all of them, and it carries short hairs along its entire length, while in the Schizopod-larva the exopodite is present and the long hairs are restricted to the tip of the stout endopodite. We must therefore recognize a bond of union or homology between these three appendages which has determined that they shall be like each other in the adult *Lucifer*; and the assumption that this similarity is due to heredity from the parent of the imaginary metameres which joined together to form the primitive Crustacean, is out of the question, for we know that no further back than the Schizopods these appendages had quite a different structure.

"The study of serial or lateral homology in other groups of animals forces us to the same conclusion, and compels us to recognize a persistent bond of union between them which cannot be due to what we usually understand by heredity.

"On the assumption that the Vertebrates are the descendants of a community of metameres, the genetic relationship between a Man's arm and a Bird's wing must be almost infinitely closer than that between a Man's arm and his leg, and this again much more recent than that between his right and his left arm. The arm and wing inherit their homology from the anterior limb of the common ancestor of Man and the Birds; but Man's arm and leg have no common ancestor more recent than the limb of the parent of the imaginary metameres which gave origin, by their union, to the ancestor of the Vertebrates, and the common ancestor of the right and left arms must have been still more remote.

"When we compare Man's arm and leg we find that they have

homologous features which are not only more recent than the time when man's ancestors diverged from the ancestors of the birds, but more recent than the separation of the anthropoid and simian stems. They resemble each other in the texture of the skin and in the shape of the nails, and these resemblances are strictly homological, that is they are not due to external conditions, but in spite of them; and we meet with countless similar resemblances all through the animal kingdom. They are not accounted for by the 'metamere' theory, even if this is fully accepted, for in many cases they are not old, but are of recent acquisition.

"In the case of the Crustacea the assumption that the remote ancestor of the group had a many-jointed body does not account for them; and as the supposed necessity for an explanation of serial homology is the only reason for believing that this remote ancestor had a great number of body-segments, it is clearly illogical to reject the embryological evidence that this ancestor was a three-jointed *Nauplius* in order to hold an hypothesis which fails to account for the facts which are supposed to render it necessary."

It seems then to be undeniable that the characters and the variation of species<sup>1</sup> are due to the combined action of internal and external agencies acting in a direct, positive, and constructive manner.

It is obvious, however, that no character very prejudicial to a species could ever be established, owing to the perpetual action of all the destructive forces of nature, which destructive forces, considered as one whole, have been personified under the name "Natural Selection."

Its action of course is, and must be, destructive and negative. The evolution of a new species is as necessarily a process which is constructive and positive, and, as all must admit, is one due to those variations upon which natural selection acts. Variation, which thus lies at the origin of every new species, is (as we have seen) the reaction of the nature of the varying animal upon all the multitudinous agencies which environ it. Thus "the nature of the animal" must be taken as the cause, "the environment" being the stimulus which sets that cause in action, and "Natural Selection" the agency which restrains it within the bounds of physiological propriety.

We may compare the production of a new species to the production of a statue. We have (1) the marble material responding to the matter of the organism; (2) the intelligent active force of the sculptor, directing his arm, responding to the psychic nature of the organism, which reacts according to law as surely as in the case of reflex action, in healing, or in any other vital action; (3) the various conceptions of the artist, which stimulate him to model, responding to the environing agencies which evoke variation; and (4) the blows of the smiting chisel corresponding to the action of Natural Selection. No one would call the mere blows of the chisel—

<sup>1</sup> The existence of internal force must be allowed. We cannot conceive of a Universe consisting of atoms acted on indeed by external forces but having no internal power of response to such actions. Even in such conceptions as those of "physiological units" and "gemmules" we have (as the late Mr. G. H. Lewes remarked) given as an explanation that very power the existence of which in larger organisms had itself to be explained:

apart from both the active force of the artist and the ideal conceptions which direct that force—the cause of the production of the statue. They are *a* cause, they help to produce it, and are absolutely necessary for its production. They are a *material* cause, but not the *primary* cause. This distinction runs through all spheres of activity.

The *formal* discoverer of a new fossil is the naturalist who first sees it with an instructed eye, appreciates, and describes it; not the labourer who accidentally uncovers but ignores it, and who cannot be accounted to be, any more than the spade he handles, other than a mere *material* cause of its discovery. So we must regard the destructive agencies of Nature as a material cause of the origin of new species; their formal cause being the reaction of the nature of their parent organisms upon the sum of the multitudinous influences of their environment.

This kind of action of “the organism”—this formal cause—has been compared by Mr. Alfred Wallace, and by me, with the action of the organism in its embryonic development; and this, I have further urged, is to be likened to the processes of repair and reproduction of parts of the individual after injury, and this, again, to reflex action, and, finally, this last to Instinct as manifested in ourselves and in other animals also.

These relations of similarity appear to me to exist between Instinct and all the various other vital actions just enumerated. Instead, then, of explaining Instinct by reflex action<sup>1</sup> (as a reflex action accompanied by sensation), I would explain reflex action, processes of repair, and processes of individual and specific evolution, by Instinct—the wonderful action and nature of which we know as it exists in our own personal activity. These seem to me to be all diverse manifestations of one kind of activity of which Instinctive Action is the best type, because by it we can to a certain extent understand the others, whereas none of the others enable us to understand it. Instinct contains reflex action, but reflex action does not contain Instinct<sup>2</sup>. But instinctive action has a wider range still. The evolution of language, of literature, of art, of science, of politics, are also embraced by it, in so far as they take place without the intervention of conscious and deliberate intention; for no one can pretend that human progress in these various directions was at first evolved by any such deliberate and intentional action. Let us glance at some simple form of language to test the truth of this assertion, supposing a case in which a man and a brute are simultaneously stimulated to expression by the same influences, that we may more

<sup>1</sup> To attempt to explain Instinct by reflex action is an attempt to explain it by omitting its most eminent characteristic—its practically telic nature—its direction to a future, unforeseen, but generally useful end. It is like the attempt to explain the building of a house by bricks, mortar, bricklayers, and hodmen, omitting all reference to any influence governing their motions and directing them towards a predetermined end which is not theirs.

<sup>2</sup> Professor Carpenter informs me that in a paper of his on the Voluntary and Instinctive Actions of Living Beings (to be found in No. 132 of the old ‘Edinburgh Medical and Surgical Journal’), read in 1837, he pointed out the essential similarity between Instinct and Reflex Action.

clearly see in what distinctively human language really consists. Let us then suppose a man and a brute to be standing under an oak-tree which begins to fall. The falling tree will produce similar effects upon the senses of both man and brute; both will instinctively fly from the danger, and both may cry out from alarm, and both, by their cries or gestures, may give rise to similar feelings of alarm in other men or brutes. Such language, whether vocal or of gesture, is *emotional* language only; but the man may do what the brute cannot do: he may emit the vocal sounds, "That oak is falling," and these words are the expression and embodiment of three universal abstract ideas:—

1. The word "oak" is a conventional sign for the idea "oak," and is a universal, abstract term applicable to every actual or possible oak. It denotes no single subsisting thing, but a whole group of things.

2. The word "is" denotes the most important of all abstract ideas—the idea of existence, or being. It is an idea (expressed in every human tongue) which we must possess in order to perform *any* intellectual act. It is an idea which, though not itself at first adverted to, makes all other ideas intelligible to us, as light, though itself unseen, renders everything else visible to us.

3. The word "falling" is a term denoting an abstract quality, and is evidently of very wide application, namely, to everything which may fall. Yet the idea itself is one single idea.

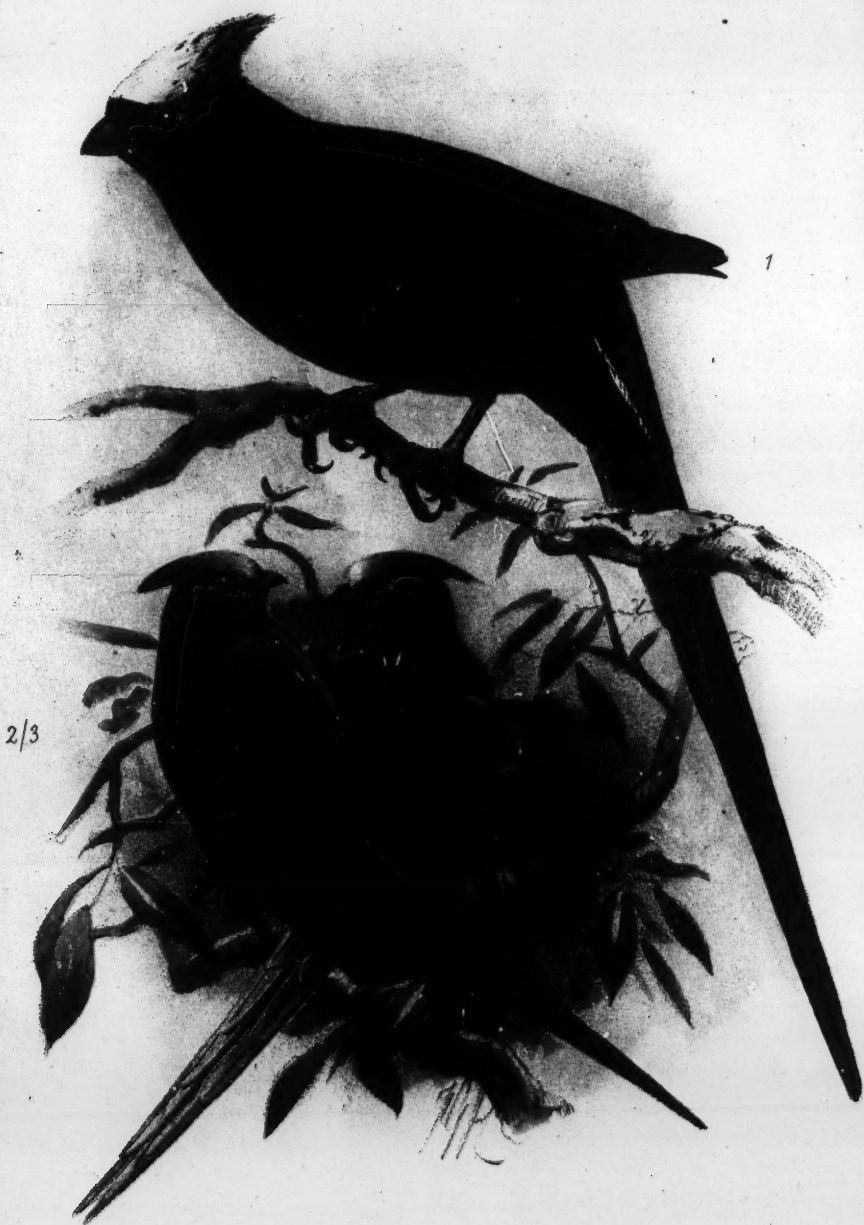
Thus all human language (apart from mere emotional manifestations) necessarily implies and gives expression to a number of abstract ideas. It is impossible for a savage to speak the simplest sentence without having formed such ideas for himself.

Is it then for a moment possible to suppose that any man deliberately invented language? Vocal and gesture signs are essentially conventional, and require comprehension on the part of those addressed as well as on the part of those who use them. Analogous considerations apply to the first beginnings of literature, art, science, and politics, which could not therefore have been consciously and deliberately invented.

The evolutions of these lofty forms of human activity are those cases of highest and most complex instinctive human actions before referred to<sup>1</sup>, which can no more be due to "lapsed intelligence" than they can be accounted for by mere compound reflex action. To do more, however, than thus briefly to refer to these matters would be to wander beyond the proper scope of this paper. Its aim is but to call attention to the close correlation which exists between the various orders of vital activity which have been now referred to, and to throw out the suggestion that it is rather in "Instinct" than in any other of these various forms of activity, that the best and most apposite type of the whole group is to be found. Such I believe to be the case, whether it may or may not be expedient to devise some different generic term to denote the whole group of such correlated activities.

<sup>1</sup> See *ante*, p. 466, the first line.





J. G. Keulemans lith.

Hanbart imp.

1. COLIUS NIGRICOLLIS.
- 2.3. COLIUS ERYTHROMELON.

November 4, 1884.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, and September, 1884:—

The total number of registered additions to the Society's Menagerie during the month of June was 223, of which 56 were by birth, 64 by presentation, 75 by purchase, 3 by exchange, and 25 were received on deposit. The total number of departures during the same period by death and removals was 92.

The following are of special interest:—

1. Two Red-cheeked Colies (*Colius erythromelon*), purchased June 12th. We have only once before received living examples of this peculiar African type, and the present species is new to the collection. Mr. Keulemans's figure (Plate XLV. figs. 2, 3) will give an idea of the form of this species and of the remarkable colour of the naked skin round the beak.

2. Two Chaplain Crows (*Corvus capellanus*) from Fao (near Busrih), at the head of the Persian Gulf, presented June 25th by B. T. Finch, Esq. We are glad to receive fresh examples of this interesting Crow, which was first described from living specimens in the Society's Gardens in 1876 (see P. Z. S. 1876, p. 693, pl. lxvi.).

The registered additions to the Society's Menagerie during the month of July were 195 in number; of these 74 were acquired by presentation, 50 by purchase, 2 by exchange, 35 by birth, and 34 were received on deposit. The total number of departures during the same period by death and removals was 117.

The most noticeable additions during the month were:—

1. A second<sup>2</sup> specimen of the Heloderm Lizard (*Heloderma suspectum*), received in exchange from the Central-Park Menagerie, New York, U.S.A., July 3rd.

2. A Collection of Snakes from Japan and North America, brought home and presented to the Society by Gerald Waller, Esq., F.Z.S., July 22nd, amongst which are representatives of five species new to the Collection, viz.:—The Four-banded Snake (*Elaphis quadrigata*), and Blomhoff's Snake (*Trigonocephalus blomhoffi*), from Japan; the American Black Snake (*Coluber constrictor*), the Mexican Snake (*Pituophis mexicanus*), and the Cyclopion Snake (*Tropidonotus cyclopion*), from North America.

3. A young female Cape Sea-Lion (*Otaria pusilla*), from South Africa, presented to the Society by Capt. John Hewat, Superintendent of the Docks, Cape Town, July 25th. This Seal forms a particularly

<sup>1</sup> See P. Z. S. 1876, p. 413, pl. xxxv.

<sup>2</sup> See P. Z. S. 1882, p. 630.

acceptable addition to the Collection, as we have just lost our former specimen of the Cape Sea-Lion, which was presented to the Society by Sir Henry Barkly, C.M.Z.S., and lived nearly thirteen years in the Gardens.

4. An African Barbet of the genus *Trachyphonus*, purchased July 29th, being the first example of this form of Barbet we have received alive. The bird appears to belong to *Trachyphonus purpuratus* of West Africa, but is not quite in adult plumage.

---

The total number of registered additions to the Society's Menagerie during the month of August was 143; of these 85 were acquired by presentation, 41 by purchase, 4 by birth, 2 by exchange, and 11 were received on deposit. The total number of departures during the same period by death and removals was 137

The following are of special interest:—

1. A Somali Wild Ass (*Equus asinus somalicus*), from Somali Land, received in exchange August 11th. I propose to give a description of this apparently new form of Wild Ass in a subsequent communication.

2. Two Blue Snow-Geese (*Chen caerulescens*), from Alaska, obtained by purchase August 11th. These are the first examples of this fine species which have been exhibited in the Society's Gardens.

3. A Flying Gecko (*Ptychozoon homalocephalum*), from Java, and six Black-spotted Toads (*Bufo melanostictus*), also from Java. They were presented to the Society by Dr. F. H. Bauer, C.M.Z.S., of Buitenzorg, Batavia.

---

The total number of registered additions to the Society's Menagerie during the month of September was 111; of these 57 were acquired by presentation, 22 by purchase, 9 by birth, and 23 were received on deposit. The total number of departures during the same period by death and removals was 119.

---

Mr. Sclater exhibited the flat skin of a Cheetah, obtained at Beaufort West, South Africa, and forwarded to him by the Rev. G. H. R. Fisk, C.M.Z.S. Mr. Sclater observed that this skin agreed nearly with that of the animal formerly in the Society's Menagerie and described and figured by him in P. Z. S. 1877, p. 532, pl. lv., as the Woolly Cheetah (*Felis lanea*), the skin of which is now in the British Museum. It was, however, rather smaller in size and more distinctly spotted, and perhaps not quite so densely furred, owing probably to the fact that the animal was, as Mr. Fisk believed, a female.

Mr. Sclater was of opinion that this skin went to corroborate the existence of *Felis lanea* as a valid species, although he was assured by Mr. Oldfield Thomas that the skull of the specimen formerly in the Society's Gardens did not differ from that of the ordinary Cheetah.

---

The Secretary exhibited, on behalf of Major W. Brydon, B.S.C., C.M.Z.S., an egg of Blyth's Tragopan (*Cerionis blythi*)<sup>1</sup>, which had been laid by a hen in the possession of that gentleman at Debrughar, Assam.

The Secretary read an extract from a letter from the same correspondent containing an account of his efforts to procure a specimen of the Takin (*Budorcas taxicolor*) for the Society. When recently on an advanced frontier-station, Major Brydon had made many endeavours to procure young specimens of this scarce animal, but was informed by the natives that it was impossible to keep it in captivity, as it always "jumped itself to death," as they expressed it.

---

The Secretary exhibited, on behalf of Mr. J. C. Parr, F.Z.S., a specimen of the chick of the Vulturine Guinea-Fowl (*Numida vulturina*), hatched in Lancashire on September 10th. The hen of this species in Mr. Parr's possession had laid very late in August, and after sitting about a week died. The six eggs were then put under a common hen, and five young chicks were the result: one, which had died on the 15th of October, was now exhibited.

The Secretary believed that this was the first instance of the Vulturine Guinea-Fowl having bred in this country.

---

The Rev. H. H. Slater, F.Z.S., exhibited a specimen of the Barred Warbler (*Sylvia nisoria*) obtained on the Yorkshire coast by himself on the 28th August, 1884. The specimen was a female bird in immature plumage. It was found in an elder-hedge by a potato-garden on the sand-hills, and was very shy and difficult to see. The first British-killed specimen of this species was exhibited at a meeting of this Society on March 4th, 1879 (see P. Z. S. 1879, p. 219).

---

Mr. H. E. Dresser exhibited specimens of *Sylvia nisoria* and *Hypolaïs icterina* killed in Norfolk, and made the following remarks:—

The Rev. H. H. Slater has just exhibited an immature specimen (the second on record as having been killed in England) of *Sylvia nisoria*, and I am glad to be able to place before you a third example of this Warbler, shot by Mr. F. D. Power, of Cold-Harbour Lane, Brixton, on the 4th of September last, in some scrub at the base of Blakeney sandhills, Norfolk. This gentleman informs me that he saw no other bird at all resembling it on that day, though Garden Warblers were very numerous. This specimen is a female in immature plumage, and closely resembles the bird exhibited by Mr. Slater. The first recorded occurrence was of a fully adult bird, which was also exhibited at a meeting of this Society by Professor Newton<sup>2</sup>. Another rare bird which I now have the pleasure to exhibit is an immature example of *Hypolaïs icterina*, also shot by

<sup>1</sup> See P. Z. S. 1872, p. 496; 1879, p. 457.

<sup>2</sup> See P. Z. S. 1879, p. 219.

Mr. Power near Blakeney, on the 11th of September last. He informs me that he shot it from a thick clump of thistles along the Cley sea-wall. No other bird was near it, although he had observed a great arrival of Wheatears, Redstarts, and one Bluethroat that afternoon, all coming direct from the north, the wind being east-north-east. As will be seen, this bird was much damaged by the shot, indeed so much so that the sex was indistinguishable. This is the third occurrence of this species in Great Britain on record.

Mr. W. B. Tegetmeier, F.Z.S., exhibited a specimen of the File-fish (*Balistes capricus*) recently caught off Folkestone.

A paper was read by Mr. F. E. Beddard on the anatomy and systematic position of a gigantic Earthworm from the Cape Colony, proposed to be called *Microchaeta rappi*.

This paper will be published entire in the Society's 'Transactions.'

The following papers were read :—

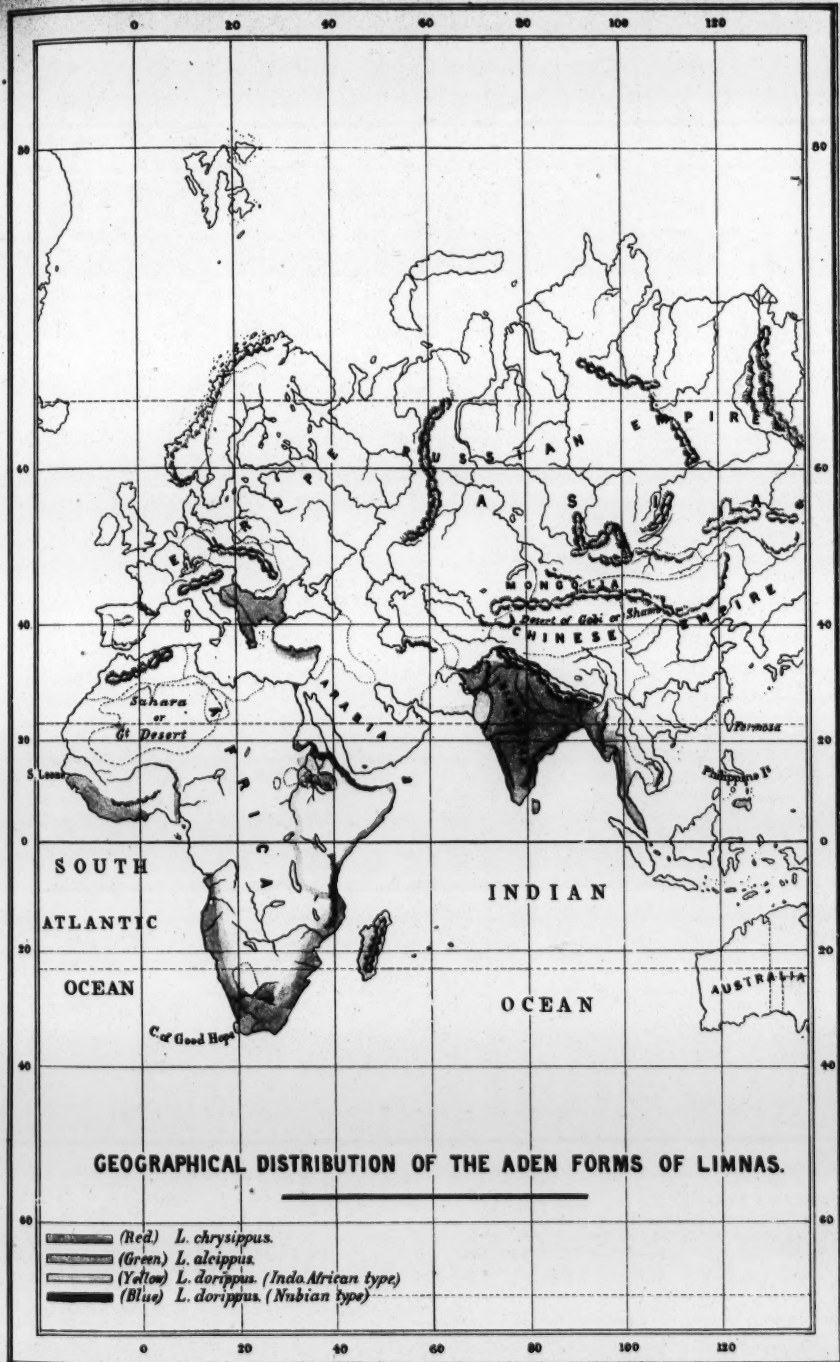
1. On a Collection of Lepidoptera made by Major J. W. Yerbury at or near Aden. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received September 30, 1884.]

(Plate XLVI.)

The collection of which this is an account is one of the greatest interest, since it not only contains fine series of the beautiful species of *Teracolus* recently described by Col. Swinhoe, but also many remarkable intergrades between certain long-established species, tending to prove either that hybrids between allied species are fertile (which I believe is rarely the case), or that in Aden a condition of things still exists which in Asia proper and in Africa has long passed away. Thus in the *Euplatinae* we find *Limnas chrysippus* gradually passing into *L. alcippus* and freely intermarrying with the Indo-African and Lower-Nubian types of *L. dorippus*; yet, as the range of these forms does not by any means correspond, they are practically distinct (see chart, Pl. XLVI.). Even in Africa, where *L. chrysippus* has a wide range, it does not appear to coexist with *L. alcippus*: it is true that the range of the latter species can be but imperfectly traced; thus, in the Museum series we only have it from Sierra Leone to Ashanti, and in Mr. Godman's collection<sup>1</sup> it occurs here and there at wide intervals over great part of Africa, but does not extend further south than the Orange River (Mr. Godman's localities are Sierra Leone, Cape Coast Castle, Winnebah, Senegal, Lower Niger, Sennaar, Abyssinia, and Kimberley). The existence of a *Hypolimnas*,

<sup>1</sup> I here desire to express my thanks to Mr. Godman for examining the whole of his specimens and forwarding to me a list of their localities.





modified in imitation of *L. alcippus*, and occurring at the Victoria Nyanza, further indicates that the species exists or formerly did exist there. On the other hand, we have received *L. chrysippus* from South, South-west, and Eastern Africa, the Mascarene and Comoro islands, and the island of Socotra; but nowhere have we known it to occur together with *L. alcippus*; the latter species is indeed omitted from Mr. Trimen's 'Rhopalocera Africæ Australis' and from other works on the Butterflies of South Africa.

Judging from its present distribution, it would seem likely that *L. alcippus* had formerly extended from the Somali Coast through Abyssinia almost in a straight line to the Gold Coast, and that southwards its range had passed from Cape Gardafui through the interior to the Nyanza, and thence, still avoiding the coast, had continued downwards to the Orange River; whether this represents its present distribution cannot at present be decided owing to our meagre knowledge of the Lepidopterous fauna of Africa.

In Asia *L. chrysippus* occurs commonly from Turkey, through Persia, Afghanistan and India, to the Philippines, but is not accompanied by *L. alcippus*. On the other hand, a very similar form, *L. alcippoides*, has been described by Mr. Moore as occurring in India, and is the *L. alcippus* of Marshall and De Nicéville's 'Butterflies of India,' of which these authors say:—"Its appearance is so erratic over a large extent of country that in distribution as well as in inconstancy of the extent of white, the idea of its being only a casual variety of *L. chrysippus* is suggested." The type, from Nepal, in Mr. Moore's collection, is paler than *L. alcippus*, and the secondaries, instead of being pure white, are tinted with fulvous; and looking to this fact, together with the paucity of specimens taken (probably eight or ten in all, so far as I can gather from the 'Butterflies of India'), their coexistence with abundance of *L. chrysippus*<sup>1</sup>, and the probability that an ancestral form would sometimes occur where the entire difference was one of colour, I should have no hesitation in regarding *L. alcippoides* as a case of reversion. In Col. Swinhoe's collection there are four of these modified forms of *L. chrysippus*, one with white veins from Bombay, one from Mhow, one from Kurrachee, and one from Deesa, the last three of the *L. alcippoides* type; he may have other examples unset. On the other hand, I believe that the tetramorphic type found at Aden represents *L. chrysippus* in its ancestral character, probably preserved through the immigration from time to time of the African forms which occur on the Somali Coast.

Two of the four forms of *Limnas* have been received from the Somali Coast, a third is in Mr. Godman's collection from Cape Gardafui, and the fourth is in the Museum collection from Socotra; all four are therefore in the neighbourhood. Moreover many Butterflies have been known to fly greater distances, and only recently I was informed incidentally by the Hon. H. S. Thomas, of the Indian Civil Service, that he had "frequently seen quite small species of

<sup>1</sup> M. de Nicéville informed me that this was the case.

butterflies crossing the Red Sea in the very teeth of a strong wind." There would therefore be nothing very extraordinary in the flight of some of the larger species across the Strait of Bab-el-Mandeb, more especially if the wind chanced to be in their favour.

Lest there should be any doubt in the minds of Lepidopterists as to the specific identity of the four forms of Aden, I quote here Major Yerbury's note on the species:—"I have taken *dorippus* and *chrysippus* 'in coitu' so often that I have given up catching them as a curiosity: I have raised caterpillars feeding on plant no. 41<sup>1</sup>; there seemed no difference between the caterpillars which turned to *chrysippus* and those that turned to *dorippus*. The chrysalides were of two colours—green with gold spots, and light waxy purple with ditto."—J. W. Y.

From notes attached to the specimens, it would appear that the green chrysalis produced the Indo-African form of *L. dorippus* and the purplish chrysalis *L. chrysippus* and intergrades towards *L. alcippus*. It is a singular fact if there really is not even a slight difference between the larvæ of the various forms.

The question now arises as to what the systematist is to do with these four forms, since they are (so far as is known) good species everywhere, excepting at Aden. If we apply to them trinomial appellations, calling one *Limnas chrysippus alcippus*, another *Limnas chrysippus dorippus*, and so on, we declare that they are local races of one species; and yet as a matter of fact they both are and are not. Again, supposing the trinomial system to be generally adopted for local races, though it would practically (if not always immediately) reduce every genus of Lepidoptera to a single species, and eventually as links continued to turn up (so as to necessitate the union of nearly allied genera) might lead back the lepidopterist by a process of retrogression to the first described butterfly, nevertheless, though all these evils might spring from the adoption of this system, *Limnas chrysippus* and one or two other Aden butterflies could not be embraced by it, because at Aden their forms are not local but mere polymorphic sports, or in a word true varieties.

In the present paper I shall keep the various named forms separate, though under one number, the first as a matter of convenience, to enable me to record the exact place and date of capture, the second to indicate that at Aden they are not distinct species.

## RHOPALOCERA.

### NYMPHALIDÆ.

#### EUPLEINÆ.

##### 1. LIMNAS CHRYSIPPUS.

*Papilio chrysippus*, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

One typical female, Aden, 26th February, 1883.

Taken in coitu with Indo-African type of *L. dorippus*.

<sup>1</sup> I cannot get the name of this plant.

Intergrade *a*.—Secondaries with the median veins white-bordered, the abdominal area partly white.

♂, Aden, 11th April, 1884; Huswah, 18th May.

Intergrade *b*.—Secondaries with the basal half of the median interspaces and the borders of the male sexual spot white.

♂, Huswah, 2nd March, 1884.

Intergrade *c*.—Secondaries with the basal three-fourths of the abdominal border, the centre of the interno-median area, and the basal half of the median interspaces white or whitish.

♂, Huswah, 2nd March, 1884.

#### 1 *a*. LIMNAS ALCIPPUS.

*Papilio alcippus*, Cramer, Pap. Exot. ii. pl. cxxvii. E, F (1779).

♂, Haithalkim, 5th April, 1884.

Slightly modified by interbreeding with *L. chrysippus*.

#### 1 *b*. LIMNAS DORIPPUS.

*Eupleea dorippus*, Klug, Symb. Phys. pl. 48. figs. 1-4 (1845).

♂ ♀, Huswah, 2nd March, 1884; ♂, Aden, 28th January and 6th March; ♀ *in coitu* with Indo-African type, 29th February.

#### 1 *c*. LIMNAS, sp. (unnamed Indo-African type)<sup>1</sup>.

*Eupleea dorippus*, var., Klug, Symb. Phys. pl. 48. fig. 5, ♂ (1845).

♂, Aden, 12th February, 1884; ♂, *in coitu* with typical *L. chrysippus*, 26th February; ♂, *in coitu* with typical *L. dorippus*, 29th February.

### SATYRINÆ.

#### 2. YPETHIMA ASTEROPE.

*Hipparchia asterope*, Klug, Symb. Phys. pl. 29. figs. 11-14 (1832).

Aden, 10th and 19th March; Lahej, 3rd, 4th, and 6th April; Shaik Othman, 20th April, 1884.

The specimens vary considerably in size, but the ocelli upon the wings are more uniform than is usual in this genus.

Major Yerbury notes *Melanitis ismene* as common at Lahej, though he failed to catch one; it is only occasionally seen in Aden.

### NYMPHALINÆ.

#### 3. HYPOLIMNAS MISIPPUS.

*Papilio misippus*, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

♀, Aden, 26th February, 1884.

"The females of this butterfly mimic all the forms of *Danainæ*;

<sup>1</sup> Although this form appears to be a distinct species when occurring in Sind, Nyassa, Abyssinia, and Arabia, it is only a variety at Aden, and therefore I do not in this place give it a distinctive name.

the mimics of *dorippus* with white and *alcippus* are rather rarer than the other types."—J. W. Y.

As might be expected, this copy of *Limnas chrysippus* is very inconstant in coloration at Aden; a specimen taken on the 27th March has lost the black apical patch, and the white subapical band is replaced by a pale tawny band (*L. inaria*, Cramer), so that this insect more nearly resembles the Indo-African type of *L. dorippus*; furthermore Col. Swinhoe confirms Major Yerbury's note to the effect that some females have white on the secondaries like *L. alcippus*, and thus would agree with my *H. alcippoides* from the Victoria Nyanza. An instance of this kind points without question to some relationship between the females of *H. misippus* and the *Limnas* which they copy, and is a sufficient answer to those who dispute the existence of protective assimilation.

#### 4. JUNONIA HERE.

*Junonia here*, Lang, Entomologist, p. 206 (Sept. 1884).

♂, Haithalkim, 4th April, 1884.

This species, which we have also from Bagdad, has long been confounded with *J. orithyia* of China. It, however, is constantly smaller, with the primaries blacker; the discoidal spots blue instead of scarlet; the external blue area transverse and with a sharply defined straight inner edge; the white band of the primaries is narrow, and the posterior ocellus little more than a black patch; the anterior ocellus of the secondaries is also represented by a large rounded black spot; the external border greenish-grey; on the under surface the apical area of the primaries and the whole of the secondaries are of a whitish stone-colour with darker and paler markings, but the secondaries correspond with those of true *J. orithyia* in the absence of distinct ocelli.

#### 5. JUNONIA CLELIA.

*Papilio clelia*, Cramer, Pap. Exot. i. pl. xxi. E, F (1775).

♂, Huswah, 24th June, 1883.

#### 6. JUNONIA CEBRENE.

*Junonia cebrene*, Trimen, Trans. Ent. Soc. 1870, p. 353.

♂ ♀, Aden, 10th October, 1883.

Mr. Kirby quotes "*J. cebrene*," Butler, as a synonym of this species. As, however, my paper was read and ordered for publication before my friend Trimen's was received by the Entomological Society, as the Secretary also altered the name which I had proposed and, *without consulting me*, gave Trimen's paper precedence in the volume, either the species should be quoted as mine, or the synonym *J. cebrene* (sic) ascribed to the person from whose pen it emanated; I should prefer the latter course.

The occurrence of *Pyrameis cardui* is noted by Major Yerbury.

7. *HYPANIS ILITHYIA*.

*Papilio ilithyia*, Drury, Ill. Exot. Ent. ii. pl. 17. figs. 1, 2 (1773).

♂, Huswah, 24th June, 1883.

<sup>1</sup> "Common at Haithalkim in March 1883; none to be found early in April 1884."—J. W. Y.

## LYCÆNIDÆ.

8. *POLYOMMATUS BÆTICUS*.

*Papilio bæticus*, Linnæus, Syst. Nat. i. 2. p. 789, n. 226 (1767).

♀, Shaik Othman, 18th January; ♂, Aden, 8th January; ♂ ♀, 4th February; ♀, 27th March, 1884.

"Generally distributed."—J. W. Y.

9. *CATOCHRYSOPS ASOPUS*.

*Lycæna asopus*, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642, n. 22; Peters' Reise nach Mosambique, Zool. v. p. 410, pl. 26. figs. 13–15 (1862).

Three females, Aden (without date).

10. *AZANUS AMARAH*.

*Polyommatus amarah*, Lefebvre, Voy. Abyss. vi. p. 384, pl. 11. figs. 5, 6 (1847).

Aden, 5th January, 18th February, 15th April; Shaik Othman, 15th January, 20th April, 1884.

Occurs also at Huswah according to Major Yerbury.

11. *AZANUS ZENA*.

*Lycæna zena*, Moore, P. Z. S. 1865, p. 505, pl. xxxi. fig. 9.

Huswah, 2nd March and 9th September; Aden, 7th March, 20th June, 5th September, and 8th November, 1883.

"Generally distributed."

We have specimens of this species received by Mr. Moore from Kutch; it occurs also at Kurrachee, and, on account of its affinity to *A. ubaldus*, has been recorded under the latter name.

Col. Swinhoe has specimens of the allied Abyssinian species *A. sigillata* collected at Aden in January and February.

12. *TARUCUS PULCHER*.

*Lycæna pulchra*, Murray, Trans. Ent. Soc. 1874, p. 524, pl. 10. figs. 7, 8.

♂ ♀, Aden, 18th and 29th February, 4th March; Lahej, 3rd April; Huswah, 2nd and 14th March, 1884.

<sup>1</sup> In his notes on Aden Butterflies Major Yerbury refers to two species. I only found one specimen (from Huswah) among his Aden specimens, and the note to this states that it is the only one ever seen; the specimens from Haithalkim are probably the same, however.

13. *TARUCUS THEOPHRASTUS*.

*Hesperia theophrastus*, Fabricius, Ent. Syst. iii. 1, p. 281, n. 32 (1793).

*Lycæna theophrastus*, Lucas, Expl. Alg., Zool. iii. pl. 1. fig. 6 (1849).

♂ ♀, Lahej, 3rd April, 1883.

Occurs also at Huswah according to Major Yerbury.

M. Lucas's figure is not very characteristic. The species may readily be distinguished from *T. nara* of India by the break in the submarginal series of spots on the under surface of the secondaries, the spots towards the costa forming a line with those beyond the cell.

14. *ZIZERA TROCHILUS*.

*Lycæna trochilus*, Freyer, Neuere Beitr. v. pl. 440. fig. 1 (1844).

*Lycæna parva*, Murray, Trans. Ent. Soc. 1874, p. 526, pl. 10. fig. 1.

Aden, 14th January; 3rd, 6th, and 18th February; 6th, 12th, and 19th March; Huswah, 2nd March; Lahej, 3rd April, 1884.

The characters upon which Mr. Murray relied for the separation of his *L. parva* from *Zizera trochilus* are not only slight but not constant:—"Its much smaller size, and also from its presenting in both wings a series of white markings immediately beyond the discal row of spots." In the eleven Aden specimens before me the size varies from 17 to 24 millimetres in expanse, the smallest specimen therefore agreeing with Mr. Murray's type, and the largest exceeding by 4 millim. the largest of our other examples of *Z. trochilus*; the white markings also (which are only expansions of the white borders to the ordinary spots) fail, or, more strictly speaking, correspond with those of *Z. trochilus*, in two specimens from the Transvaal in the Museum collection.

15. *ZIZERA KNYSNA*.

*Lycæna knysna*, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 282 (1862).

Shaik Othman, 18th January, 9th March; Huswah, 2nd April; Lahej, 3rd April, 1884.

As a rule slightly larger than specimens from South Africa, but exactly corresponding in every other respect; one example taken at Shaik Othman on the 20th April is somewhat aberrant, being small even for typical *Z. knysna*, and with the under surface as white in tint as that of *Z. pygmæa*.

16. *ZIZERA GAIKA*.

*Lycæna gaika*, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 403 (1862).

Aden, 4th February, 6th and 12th March; Haithalkim, 4th April, 1884.

The specimens correspond in all respects with those from South Africa.

17. *DEUDORYX LIVIA*.

*Lycæna livia*, Klug, Symb. Phys. pl. 40. figs. 3-6 (1834).

Aden, 25th December, 1883; 5th, 6th, and 20th January, and 17th February, 1884.

The female of this species (of which Klug figures two males) closely resembles the *Dipsas antalus* of Hopffer, two females of which are evidently represented as sexes.

## PAPILIONIDÆ.

18. *TERIAS CHALCOMIÆTA*.

*Terias chalconiæta*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 190, n. 10 (1879).

Lahej, 3rd and 6th April; Haithalkim, 4th April, 1884.

The seven examples forwarded by Major Yerbury are separated by him under four different numbers, probably on account of their difference of size and the more or less pronounced character of the markings on the under surface; in some specimens these are as sharply defined as in *T. æsiopæ*, whilst others agree with the type from Johanna in almost every particular.

The *Catopsilia* of the collection appear to repeat, to a certain extent, the peculiarities of the forms of *Limnas*, since they are undoubtedly connected by intergrades in such a manner as to render their separation very difficult.

When I published my Monograph of *Callidryades*, I recognized two African types, *Catopsilia pyrene* and *C. florella*, which, at the time, were believed by Mr. Trimen to be dimorphic forms of one species; this belief was based upon the capture of a supposed *C. pyrene* ♂ in coitu with a *C. florella* ♀: his words are as follows:—"On one occasion near Durban, Port Natal, I took a white ♂ and yellow ♀ in copuld. Females of the paler colouring are certainly scarcer than the others; but Mr. Bowker writes that he has noticed them in Basuto-Land, and Mr. Hewitson possesses one from Madagascar, which resembles the yellowish-white specimen from Bourbon, figured in M. Maillard's 'Notes sur l'Ile de la Réunion (Bourbon),' published in 1862."

The pale female in Mr. Hewitson's collection is my *C. rufo-sparsa*, and differs from *C. florella* not only in its pale colouring, but in the total absence of the angular subapical series of spots on the primaries, the shorter secondaries, the ochreous instead of chrome-yellow colouring of the under surface, the denser and less striate character of the reticulate markings, and the suffused ill-defined character of the discal series of spots.

In a collection received some years since from Abyssinia were great numbers of a *Catopsilia* which I took to be *C. florella*, and one of these I selected for the sake of its locality. On setting it, however, I found it so distinct—the central area of the wings being occupied by a broad white belt, and the under surface of the secondaries showing only one instead of three silver spots—that I concluded to describe it as a new species under the name of *C. aleurona*.

In Aden the *Catopsilia* appear to be very common, thirty-nine specimens being in the present collection. The females separate readily into four types; but as regards the males I agree with Major Yerbury in admitting that "I have found it very difficult to separate the different *Catopsilia*." They have, however, enlightened me upon one point, which is, that the males of *C. pyrene* and *C. florella* (as in many other species of *Callidryas*) are extremely similar, whilst the females are entirely different; that, consequently, Boisduval was in error as to the male of the latter species, whilst my friend Trimen was partly right and partly wrong. The male of *C. florella* is indeed white and very like that sex of *C. pyrene*; but I have little doubt of its distinctness from that species in Tropical Africa, though in Aden I have every reason to believe that *C. pyrene*, *C. aleurona*, and *C. florella* are one species; this opinion I base not only upon the fact that all fly together (for that is not conclusive evidence of identity), but from the existence in Aden of a fourth form between *C. pyrene* and *C. aleurona* and perfectly intermediate on both surfaces. This intergrade, which I believe to be M. Boisduval's *C. hyblæa* described from a Senegalese specimen, resembles *C. rufo-sparsa* of Madagascar and *C. gnoma* of India on the upper surface, but on the under surface is only a little yellower than *C. pyrene*, with similar greyish reticulations and barely a trace of the discal series of spots.

If in Tropical Africa *C. florella* were merely a dimorphic form of the female of *C. pyrene*, as Mr. Trimen clearly supposed it to be, there is no reason why intergrades between the females should not occur commonly with them there, as at Aden; yet this is not the case. On the other hand, admitting the distinctness of the two species in Southern and Western Africa, the fact that they are one species in Aden can be explained by the not improbable supposition that the Abyssinian type has steadily migrated in that direction, and, being almost exactly intermediate between the two, has rendered the preservation of a tetramorphic species possible in this case as in that of *Limnas chrysippus*; nor in my opinion is such a supposition at all fanciful in the case of genera which are notorious for the possession of a strong migratory instinct.

In the present paper I must necessarily treat the forms of *Catopsilia* as I have done those of *Limnas*.

#### 19. CATOPSILIA FLORELLA.

♀ *Papilio florella*, Fabricius, Syst. Ent. p. 479, n. 159 (1775).  
*Callidryas (Catopsilia) florella*, Butler, Monogr. in Lep. Exot. p. 56, pl. xxii. figs. 1, 2, 2 a (1871).

♂, Aden, 26th February, 1883; ♀, 27th March, ♂, 14th April, 1884; ♂, Lahej, 3rd April, 1884.

The males are larger than those of *C. pyrene*, have the primaries more produced, with incurved outer margin rather distinctly spotted with smoky grey; on the under surface also the angular discal sub-apical streak is tolerably distinct.

## 19 a. CATOPSILIA ALEURONA.

♀ *Catopsilia aleurona*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 489 (1876).

♂, Aden, 4th and 23rd February and 10th March; ♀, 15th April;  
♂, Shaik Othman, 9th March; ♀, Lahej, 6th April, 1884.

The males barely show a trace of marginal spotting on the upper surface, and are slightly paler on the under surface than in *C. florella*; at the same time there is so much similarity between them that, unless taken in copula in Abyssinia, it would be impossible to assert that no taint of *C. florella* had modified the normal characteristics of the race<sup>1</sup>.

## 19 b. CATOPSILIA HYBLÆA.

♀ *Callidryas hyblæa*, Boisduval, Sp. Gén. Lép. p. 612, n. 11 (1836).

♂, 6th January, 23rd February, 8th March; ♀, 12th March;  
♂, 21st March.

Nine males and three females received; both sexes are smaller than in *C. aleurona*, of a paler greenish-sulphur tint below, with the markings, excepting the small ocellated spots, very ill-defined.

## 19 c. CATOPSILIA PYRENE.

♂ ♀, *Colias pyrene*, Swainson, Zool. Ill. 1st ser. pl. 51 (1820-1).

♂, Aden, 21st and 27th March; ♀, 12th March; ♀, Lahej, 3rd April; ♂ ♀ (in coitu), 4th and 6th April; ♂, 10th April;  
Shaik Othman, 20th April.

## 20. TERACOLUS CALAIS.

*Papilio calais*, Cramer, Pap. Exot. i. pl. 53. figs. C, D (1779).

Aden, 5th, 14th, 22nd, and 28th January; 10th April, 1884;  
10th and 14th October, 1883.

## 21. TERACOLUS DYNAMENE.

*Pontia dynamene*, Klug, Symb. Phys. pl. 6. figs. 15, 16 (1829).

♂ ♀ in coitu, Aden, 15th February, 1884; ♂, 29th August, 1883.

The female taken in coitu is not distinguishable from that sex of *T. calais*, to which species it is, I should say, undoubtedly to be referred; the two species are perfectly distinct and readily separable, so that it is extremely unlikely that any fertile eggs would have been produced, or, at any rate, would have yielded healthy larvæ; if, however, hybrids were reared, they ought to resemble *T. carnifer* more than anything else.

<sup>1</sup> I must here remind Lepidopterists that whenever I speak of a species of Butterfly or Moth, I mean exactly what is understood in some of the other Orders by a local race; all "species" of Lepidoptera being, in my opinion, local races.

21 a. *TERACOLUS CARNIFER*.

*Teracolus carnifer*, Butler, P. Z. S. 1876, p. 138, n. 42, pl. vii. figs. 8, 9.

♂, Aden, 7th July, 1883.

This form was described upon specimens in Mr. Moore's collection from Mynpuri, N.W. Punjab; in the Museum we have a pair from Kurrachee, presented, along with specimens of *T. dynamene*, by Col. Swinhoe; now again a single male comes from Aden in company with *T. dynamene*. I think therefore that the distinctness of this form from the latter must be regarded as extremely doubtful, unless it can be shown by breeding that it is a different species. At the same time, the two forms are sufficiently dissimilar to leave the question of their specific identity an open one for the present.

22. *TERACOLUS PHISADIA*.

*Pieris phisadia*, Godart, Enc. Méth. ix. p. 132, n. 40 (1819).

Var. *Pontia arne*, Klug, Symb. Phys. pl. 7. figs. 1-4 (1829).

♂, Aden, 6th and 20th January; ♀, 27th March and 10th April, 1884; ♀, 6th July, 29th August; ♂, 1st September, 10th October; ♀, 14th October, 1883; ♂, 30th December, 1882; ♂ ♀, Lahej, 3rd April (*in coitu*); ♀, Haithalkim, 5th April, 1884.

The males are large, and therefore belong to the variety figured by Klug; the females show every gradation from the pure yellow form of Klug's figure to a form almost exactly agreeing with the male; there is also a salmon-yellow variety, and a variety of a creamy-white colour, slightly suffused with salmon in the centre and along the costa of the primaries.

23. *TERACOLUS VI*.

*Teracolus vi*, Swinhoe, P. Z. S. 1884, p. 437, pl. xxxix. figs. 6, 7.

♂, Aden, 6th January, 4th February, 11th April, 1884; ♀, 18th October and 8th November; ♂, 23rd October and 8th December, 1883.

24. *TERACOLUS PLEIONE*.

*Pontia pleione*, Klug, Symb. Phys. pl. 8. figs. 7, 8 (1829).

♀, Aden, 26th February; ♂, ♀, 27th March, 10th April; ♀, 15th April, 1884.

24 a. *TERACOLUS MIRIAM*.

*Idmais miriam*, Felder, Reise der Nov., Lep. ii. p. 190, n. 186, pl. 27. figs. 3, 4.

*Teracolus chrysomela*, Butler, Cist. Ent. p. 244 (1874).

♂, ♀, Aden, 6th January (*in coitu*); ♂, ♀, 27th March; ♂, ♀, 10th April.

The fact that these Butterflies are all caught flying together, taken in conjunction with the slight difference which separates the one from the other, seems to me to indicate that *T. miriam* is only an under-coloured variety of *T. pleione*: its sole distinction is that the

secondaries in the male have no marginal spots, and that in the female these spots are very small. Major Yerbury, however, sends the following note, which argues in favour of the existence of more than one species here; if by breeding he can prove this to be the case, I shall not be at all distressed, though certainly surprised thereby. He says:—"I fancy there are three distinct insects under these two numbers (attached to specimens indicated under *T. pleione* and var.)—*first*, the ordinary common male with the white female; *second*, the yellow females (the males I have taken *in coitu* with yellow females seem to have the orange coming down lower on the hind wing); and *third*, the males of a brighter, richer colour—these are so conspicuous that one notices them at once when on the wing. I have raised one or two caterpillars; there certainly are at least two different sorts of caterpillars to be found on plant no. 23 (*Cleome*, n. sp.?). Only *T. pleione* resulted, but, at the time when I raised these caterpillars, I only had one breeding-glass, so could not tell what turned to what."

I may note that a small male *T. acaste* "from chrysalis" was labelled with the same number as *T. pleione*. A female *T. miriam* was also taken *in coitu* with *T. pleione*, ♂.

## 25. TERACOLUS CŒLESTIS.

*Teracolus celestis*, Swinhoe, P. Z. S. 1884, p. 435, pl. xxxix. figs. 1, 2.

♂ ♀, 6th January, ♀, 23rd January, 1884; ♂, 2nd March, 1883; ♀, 12th, and ♂ ♀, 27th March, ♂, 10th April; Lahej, 6th April, 1884.

Either this species is extremely variable or it hybridizes with *T. acaste* of Klug, and thus produces intergrades to that species; in the absence of direct evidence I am inclined to think the latter to be the case. In his recent paper on *Teracolus*, Col. Swinhoe regarded the white females as albino varieties of his *T. cœlestis*, and could not be persuaded to believe that they were represented by Klug's figures; yet these figures, though a little too black, are really not bad, whereas the figures of *T. pleione* are not at all like anything we have ever seen, and nevertheless Col. Swinhoe did not hesitate to agree with me that they were intended to represent the Aden species.

Between *T. cœlestis*, then, and *T. acaste* we have two intergrades, both of them smaller in both sexes than *T. cœlestis*. The first of these has the outer border of the primaries in both sexes broader than in *T. cœlestis*, and the upper surface, especially of the secondaries in the female, of a paler sulphur-yellow: this I shall regard as a simple variety of *T. cœlestis* reduced in size and colour by crossing with *T. acaste*. The second intergrade differs but little in the male sex from that last mentioned, excepting that the blackish border is narrower and tapers more towards the external angle<sup>1</sup>; the females, however, have lost the yellow colouring (or rather, if my view be correct, have not acquired it), only the diffused pale orange

<sup>1</sup> I should have found it difficult to decide which were the males of this form, had they not fortunately been taken *in coitu* with the females.

nebula being present upon the primaries: this I propose to regard as a variety of *T. acaste*, modified in colouring by crossing with *T. celestis*.

Intergrade 1 = *T. celestis*, var.

♂, Aden, 2nd March, 1883; ♀, 10th April, 1884; ♀, 1st July, 1883.

Intergrade 2 = *T. acaste*, var.

♂ ♀, Aden, 26th February, 1884, in coitu (two pairs).

## 26. TERACOLUS ACASTE.

*Pontia acaste*, Klug, Symb. Phys. pl. 7. figs. 16, 17 (1829).

♂, Aden, 27th March, 10th April (from chrysalis), 1884; ♀, 3rd June and 5th September, 1883.

In Hewitson's collection two females of *T. acaste* stand under *T. halimede*, whilst *T. acaste* is represented by four females of *T. pleione* and one of *T. acaste*, *T. pleione* consisting of one typical male and three males of the variety *T. miriam*; one of the females labelled "Red Sea" corresponds more closely with Klug's figures than those in the present collection, but is evidently referable to the same species.

As *T. acaste* appears to have a wider range than *T. celestis*, it would be at any rate premature to regard them as mere sports of one variable species.

## 27. TERACOLUS PROTOMEDIA.

*Pontia protomedia*, Klug, Symb. Phys. pl. 8. figs. 13, 14 (1829).

♂ ♀, Haithalkim, 4th and 5th April; ♀, Lahej, 6th April; ♂ ♀, Shaik Othman, 20th April and 11th May, 1884.

It is a curious thing that specimens of this species almost invariably arrive in a more or less broken condition; of the ten examples before me only two males came to hand in anything like a perfect state; possibly their brilliant colouring may render them especially attractive to birds. The species is an interesting one, since it links the *T. hewitsoni* and *T. halimede* groups.

## 28. TERACOLUS MILES.

*Teracolus miles*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 105 (1883).

♂, Aden, 11th July, 1883.

The example does not perfectly agree with the type from the Victoria Nyanza, but is too close to render it safe to separate it upon a single specimen. Major Yerbury says that he has only seen two examples, "one on the 7th July and the other a few days later."

## 29. TERACOLUS EPIGONE.

*Anthopsyche epigone*, Felder, Reise der. Nov., Lep. ii. p. 186, n. 180.

♂ ♀, Haithalkim, 4th and 5th April, 1884.

## 30. TERACOLUS NOUNA.

*Anthocharis nouna*, Lucas, Expl. Alg., Zool. iii. p. 350, n. 14 pl. 1. fig. 2 (1849).

♂ ♀, Huswah, 30th March and 18th May; ♂, Haithalkim, 5th and 20th April, 1884.

The specimens agree tolerably closely with the figures by M. Lucas.

## 31. TERACOLUS SAXEUS.

*Teracolus saxeus*, Swinhoe, P. Z. S. 1884, p. 441, pl. 40. figs. 1, 2.

♂, Huswah, 14th March, 1884; ♀, 9th September, 1883; ♀, Lahej, 9th September, 1883.

Differs from the preceding in the subapical oblique orange band on the primaries below being of double the width, and in the much more pink colour of the under surface of the secondaries; the female also is destitute of the oblique brown line near the inner edge of the broader orange apical patch. It is, of course, possible that the two may be dimorphic forms of one species, but this can only be satisfactorily decided by breeding.

## 32. TERACOLUS YERBURII.

*Teracolus yerburii*, Swinhoe, P. Z. S. 1884, p. 441, pl. 39. fig. 12.

Haithalkim, 4th and 5th April; Shaik Othman, 11th May, 1884.

Occurs also at Lahej according to Major Yerbury. The species had evidently been some time on the wing when obtained, as only one of the six examples received was uninjured.

## 33. TERACOLUS SWINHOEI, sp. n.

♂. Allied to the preceding species, from which it differs as follows:—Wings longer, the primaries with rounded apex and external angle, upper surface sulphur-yellow instead of milky white; the black-brown apical patch of primaries more oblique, with the band of five orange spots decidedly narrower, more oblique, less angular, and with narrower blackish inner edge; secondaries with the grey basi-costal scaling continuous with the outer edge of the costal blackish spot, the apical patch unbroken; the squamose grey band, from the apical patch to the submedian vein, further from the outer margin and paler than in *T. yerburii*; the black marginal spots much larger; under surface tinted with sulphur-yellow throughout, bright sulphur-yellow over the basal half of the primaries and the external border, the subapical orange band much brighter and (as on the upper surface) narrower and more oblique. Expanse of wings 42 mm.

Haithalkim, 5th April, 1884.

"The only specimen."—J. W. Y.

## 34. BELENOIS LORDACA.

*Pieris lordaca*, Walker, Entom. v. p. 48.

♂ ♀, Huswah, 14th and 30th March; ♀, Haithalkim, 5th April, 1884.

The males are smaller than one in the Museum collection from PROC. ZOOL. SOC.—1884, No. XXXIV.

Damascus, but that is probably an exceptionally large example; there is no difference between a female from Damascus and one from Huswab.

"I have raised caterpillars of this on *Capparis galeata*."—*J. W. Y.*  
A caterpillar taken on the 14th March emerged on the 24th.

### 35. BELENOIS LEUCOGYNE, sp. n.

Allied to *B. elisa* and *B. johannæ*. Size of *B. severina*: the male above milky white: primaries as in *B. boguensis*, with narrow oblique black discocellular streak and tapering, internally zigzag, external border enclosing five spots of the ground-colour, the second largest; secondaries with a marginal series of triangular blackish spots indistinctly connected by a few dusky scales here and there: under surface most like *B. boguensis*; primaries milky white, the apical or external border brown, darker along its inner edge and enclosing six primrose-yellow spots, one being placed within the subcostal furca; secondaries primrose-yellow, with a chain-like series of four large spots of the ground-colour upon a brown ground, an abbreviated brown irregular stripe from costa to second subcostal branch. Female above sulphur-yellow; primaries with black discocellular bar and external border as in *B. boguensis* ♀; secondaries with narrow external black border and subcostal stripe; four small submarginal spots of the ground-colour; primaries below reddish brown towards apex; seven lemon-yellow spots upon the external border, otherwise as above; secondaries pearl-white, streaked and bordered with lemon-yellow, border brown; otherwise as above. Expanse of wings 55 mm.

♂, Lahej, 3rd April; ♂ ♀, Haithalkim, 4th and 5th April, 1884.

### 36. SYNCHLOE GLAUCONOME.

*Pontia glauconome*, Klug, Symb. Phys. pl. 7. figs. 18, 19 (1829).

Aden, 25th and 28th January, 1883; 5th and 12th February (from chrysalis), 1884.

"The caterpillar of this butterfly feeds in Aden on plant no. 42 (*Cleome paradoxa*), but in the interior it feeds on no. 43 (*Dipterygium glaucum*); it is generally distributed."—*J. W. Y.*

*S. iranica* of Bienert, from Persia and Afghanistan, is closely allied to this species; on the upper surface it differs chiefly in the larger white spots on the apical border of the primaries; on the under surface, however, it is readily separable by the absence of the green basi-abdominal patch on the secondaries, and the paler yellower tint of the other green markings on all the wings.

A discoloured chrysalis forwarded by Major Yerbury as possibly that of *Teracolus phisadia* appears to me to belong to this species; it is of the usual form and shows the wing-pattern distinctly.

### 37. NEPHERONIA ARABICA.

*Eronia buquetii*, var. *arabica*, Hopffer in Peters's Reise nach Mosambique, Zool. v. p. 363, var. β (1862).

Lahej, 3rd and 6th April; Haithalkim, 4th April, 1884.

Hopffer probably only had a female before him when he wrote his diagnosis of this form. The under surface of the secondaries and apex of primaries in the male is of a pearly greenish tint, the dusky atoms being confined almost entirely to the costal border of the secondaries; the female even is scarcely ochraceous on the under-surface; I should rather describe the secondaries as sericeous greenish yellow, sparsely reticulated with greyish squamose striæ; the usual purplish discocellular marking with white centre and creamy-white spot attached to its outer edge.

There is no doubt that the local forms named by Hopffer *E. mosambicensis*, *capensis*, and *arabica* are permanent, and should be kept separate.

#### HESPERIIDÆ.

##### 38. HESPERIA ANCHISES.

*Ismene anchises*, Gerstaecker in Von der Decken's Reisen in Ost-Africa, iii. p. 374, n. 29, pl. xv. figs. 6, 6a (1873).

Aden, 8th July, 1884.

Also "Huswah" according to Major Yerbury.

We have *H. anchises* also from the Victoria Nyanza.

##### 39. PARNARA MATHIAS.

*Hesperia mathias*, Fabricius, Ent. Syst. Suppl. p. 433 (1798); Butler, Cat. Fabr. Lep. pl. 3. fig. 6 (1870).

Aden, 3rd February, 1884, 12th June and 7th December, 1883; Huswah, 2nd March; Shaik Othman, 20th April, 1884.

Also at Lahej according to Major Yerbury.

##### 40. GEGENES KARSANA.

*Hesperia karsana*, Moore, P. Z. S. 1874, p. 576, pl. 67. fig. 6.

♂, Aden, 3rd February, 1884; ♀, Shaik Othman, 1st September, 1883.

Also occurs at Huswah.

##### 41. PYRGUS EVANIDUS (var. ADENENSIS).

*Pyrgus evanidus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 223.

Aden, 3rd, 23rd, and 26th February, 1884, and 2nd March, 1883.

All the specimens are much darker on the under surface than those from Sind and Beloochistan, the apex of the primaries having the blackish ground-colour of the remainder of the wing, and the secondaries having the ground-colour dark greyish olivaceous instead of pale yellowish. As the Aden form may prove to be distinct (and is at any rate more worthy of a name than many of the forms recognised on the Continent), I propose to call it var. *adenensis*.

##### 42. THANAOS DJÆLÆLÆ.

*Pterygospidea djælälä*, Wallengren, Lep. Rhop. Caffr. p. 54 (1857).

Aden, 1st July, 1883.

This species appears to be common in Angola, whence most of Hewitson's specimens were obtained; we have one example from Angola and one from Abyssinia.

### HETEROCERA.

In addition to the specimens received from Major Yerbury, we possess a small series presented by Col. Swinhoe, which I propose to include in this list, when in sufficiently good order for identification; as, however, this series was preserved in spirit, it is not surprising to find that some of the specimens are unrecognizable.

#### SPHINGIDÆ.

##### 43. *LOPHURA NANA*.

*Lophura nana*, Walker, Lep. Het. viii. p. 107, n. 4 (1856).

Aden (from chrysalis), 8th April, 1884.

The remainder of the Moths are only numbered, no notes accompanying them; the type was from Natal.

##### 44. *BASIOTHEA IDRICUS*.

*Sphinx idricus*, Drury, Ill. Nat. Hist. iii. p. 2, pl. 2. fig. 2 (1773).

Aden.

We have the species from Natal, Sierra Leone, and Abyssinia.

##### 45. *CHÆROCAMPA CELERIO*.

*Sphinx celerio*, Linnæus, Syst. Nat. i. 2, p. 800 (1766).

Two examples, Aden.

We have this widely distributed species from Abyssinia (a locality not recorded in my Revision of the family).

##### 46. *DEILEPHILA LIVORNICA*.

*Sphinx livornica*, Esper, Ausl. Schmett. ii. pp. 87, 196, pl. 8. fig. 4 (1785).

♂, Aden.

A single specimen, rather darker than Turkish examples, but evidently to be referred to the same species.

##### 47. *DAPHNIS NERII*.

*Sphinx nerii*, Linnæus, Syst. Nat. i. 2, p. 798, n. 5 (1766).

♀, Aden.

A pale example, and therefore not of the African type.

##### 48. *PROTOPARCE ORIENTALIS*.

*Protoparce orientalis*, Butler, Trans. Zool. Soc. 1876, vol. ix. p. 609, n. 21, pl. 91. figs. 16, 17.

♂, Aden.

One slightly rubbed specimen of this Eastern form of *P. convuli*.

## LITHOSIIDÆ.

## 49. DEIOPEIA PULCHELLA.

*Tinea pulchella*, Linnæus, Syst. Nat. i. 2, p. 884, n. 349 (1766).

Three specimens, Aden.

## LEUCANIIDÆ.

## 50. LEUCANIA EXTRANEA.

*Leucania extranea*, Guénée, Noct. i. p. 77, n. 104.

One bad specimen, Aden (*C. Swinhoe*).

The specimen was just good enough to permit of its being recognized.

## XYLOPHASIIDÆ.

## 51. XYLOPHASIA OPPOSITA, var.

*Mamestra opposita*, Walker, Lep. Het. Suppl. ii. p. 667 (1865).

♂, Aden.

Only differs from the type-specimens (from S. India and Ceylon) in having an oblique diffused belt of scarcely perceptibly redder colour from centre of inner margin to apex of primaries.

The species of *Xylophasia* are well known to be variable in the ground-colour of the wings, and dimorphism is probably prevalent, as with *X. rurea* and var. *combusta* (which resembles a *Mamestra*). I should not be surprised if the N.-American *Mamestra dubitans* prove to be a similar dimorphic form of *Xylophasia lignicolora*.

## 52. PRODENIA CARADRINOIDES.

♀ *Laphygma caradrinoides*, Walker, Lep. Het. ix. p. 190, n. 8 (1856).

♂ *Prodenia ingloria*, Walker, l. c. xv. p. 1679 (1858).

♂ ♀, Aden.

The type of *L. caradrinoides* was from Natal, but that of *P. ingloria* from Moreton Bay, so that their separation as distinct species was excusable; we have received both sexes together from the Hawaiian Islands. The range of this species is therefore most extensive.

## APAMIIDÆ.

## 53. PERIGEA INEXACTA.

*Perigea inexacta*, Walker, Lep. Het. Suppl. ii. p. 682 (1865).

Aden (*Swinhoe*).

The type of the species was from the Cape of Good Hope.

## 54. AMYNA STIGMATULA?

*Erastria stigmatula*, Snellen, Tijds. voor Ent. xv. pl. 4. fig. 15 (1872).

Aspect above of *A. stellata* of Japan, from which, however, it differs in the grey-edged scales of the primaries, giving it a mottled

character, the scales themselves redder, the inner whitish-edged brown line nearer the base more oblique and sinuated (not denticulated); reniform spot larger, more oblique, its inferior lobe stramineous instead of pure white; outer line more parallel to the inner, regularly dentate-sinuate, the sinuations wider than in *A. stellata*; secondaries (like the primaries) darker and redder than in the Japanese species; the thorax mottled like the primaries: on the under surface all the wings are grey, slightly paler beyond the postmedian line, which is not sharply defined and very slightly undulated, whereas in *A. stellata* the costal and apical borders of primaries and the whole surface of the secondaries on the underside are whitish, and the postmedian line on the secondaries is further from the outer margin, sharply defined, dark brown and deeply dentate-sinuate. Expanse of wings 26 mm.

♂, Aden (*Yerbury* and *Swinhoe*).

In a paper in the Proceedings of this Society for 1881 (p. 617) I recorded *Amyna cephusalis* as from Kurrachee; the specimen is a good deal worn, but certainly belongs to the present species and not to *A. cephusalis*: the latter is in fact more nearly allied to *A. stellata* than the present species is; nevertheless, in the absence of a good example of *A. stigmatula* for comparison with that received from Col. Swinhoe, it was impossible to see in what respects the latter differed from *A. cephusalis*, and therefore I concluded it to be a variety of the same. Snellen's figure is not good, but I think represents this species.

The specimen presented by Col. Swinhoe is much disguised in colouring by its immersion in spirit, but is otherwise in fair condition.

#### HELIOTHIDÆ.

##### 55. HELIOTHIS ARMIGERA.

*Heliothis armigera*, Hübner, Noct. pl. 79. fig. 370 (1805-24).

Aden (*Swinhoe*).

#### ACONTIDÆ.

##### 56. XANTHODES INNOCENS.

*Xanthodes innocens*, Walker, Lep. Het. xv. p. 1752 (1858).

Aden.

#### ERIOPIDÆ.

##### 57. CALLOPISTRIA YERBURII, sp. n.

Nearest to *C. exotica*: of the same general coloration and size; wings a little darker; the outer or discal stripe more slender, not lunulated, its upper portion much more strongly arched, so as to impinge upon the submarginal triangular spots, its lower portions strongly inangled; under surface greyer, more uniform in colour, without any golden reflection, the white markings obsolete. Expanse of wings 30 millim.

Aden.

## EURHIPIDÆ.

## 58. EUTELIA DISCISTRIGA.

*Eutelia discitriga* (sic), Walker, Lep. Het. Suppl. iii. p. 823 (1865).

Aden (*Yerbury* and *Swinhoe*).

## PLUSIIDÆ.

## 59. PLUSIA LIMBIRENA.

*Plusia limbirena*, Guénée, Noct. ii. p. 350, n. 1179.

Aden (*Swinhoe*).

Occurs also in Abyssinia.

## GONOPTERIDÆ.

## 60. COSMOPHILA XANTHINDYMA.

*Cosmophila xanthindyma*, Boisduval, Faune Ent. Madag. p. 94, pl. 13. fig. 7.

*Cosmophila indica*, Guénée, Noct. ii. p. 396, n. 1256.

*Cosmophila auragoides*, Guénée, l. c. p. 397, n. 1258.

*Cirrædia edentata* and *variolosa*, Walker, Lep. Het. xi. p. 750 (1857).

♂ ♀, Aden.

We have this species from Madagascar, Natal, West Africa, Ceylon, and various parts of India and Australia. It is probably identical with Walker's *Cirrædia edentata* from Tasmania, but, in my opinion, does not quite agree with *Cosmophila erosa* of the New World, a constant character for separating which appears to obtain in the more deeply sinuous, more angular, and more narrowly fringed outer border of the primaries; it is also as a rule of a more lively colour, with the external half of the primaries of the male by no means so dark.

## 61. GONITIS SUBULIFERA.

*Gonitis subulifera*, Guénée, Noct. ii. p. 404, n. 1272 (1852).

Aden (*Yerbury* and *Swinhoe*).

This species was originally described from an Abyssinian example.

## 62. GONITIS PROPINQUA, sp. n.

Closely allied to *G. fractifera* of St. Domingo, some varieties (the greyer ones) of which it closely resembles in size, colour, and, pattern, with the following exceptions:—It is usually greyer and darker; the palpi are more slender, though not quite so long; the reniform spot on the primaries is more oblique, the black dots within it being blurred; the outer line of the central belt is much more irregular and bends more strongly outwards towards the inner margin; the inner margin of the primaries is shorter, thus equalizing the divisions from the angle of the outer margin; the sinus above the angle is also deeper. Expanse of wings 38 millim.

Aden (*Yerbury* and *Swinhoe*).

We have long had a worn example of this species from Abyssinia

and three from Natal : the latter are most like the New-World species, agreeing better in colour and in the absence of black spots on the tips of the fringe, which also is reddish as in *G. fractifera*. Possibly a long series might prove that they were distinct.

#### POLYDESMIDÆ.

##### 63. PANDESMATA QUENAVADI.

*Pandesma quenavadi*, Guénée, Noct. ii. p. 438, n. 1310 (1852).

Aden.

We have this species from Kurrachee and other parts of India.

#### OPHIDERIDÆ.

##### 64. OPHIDERES MATERNA.

*Phalæna-Noctua materna*, Linnæus, Syst. Nat. ii. p. 840, n. 117.

Aden (♂ *Swinhoe*; ♀ *Yerbury*).

We have received the female of this species from Abyssinia; it is a common Indian insect.

#### OMMATOPHORIDÆ.

##### 65. CYLIGRAMMA LATONA.

*Phalæna-Noctua latona*, Cramer, Pap. Exot. i. p. 20, pl. 13. fig. B (1779).

Aden.

We have received this species from Nyassa.

#### OPHIUSIDÆ.

##### 66. SPHINGOMORPHA MONTEIRONIS.

*Sphingomorpha monteironis*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xvi. p. 406, n. 81 (1875).

♂, Aden.

We have also received this species from Abyssinia; the present specimen is a little darker than any of our examples from various parts of Africa, but corresponds with them in pattern.

##### 67. ACHÆA CATILLA.

*Achæa catilla*, Guénée, Noct. iii. p. 247, n. 1667.

Aden.

We have this species from Abyssinia, Rodriguez, and Madagascar.

##### 68. GRAMMODES STOLIDA.

*Noctua stolida*, Fabricius, Sp. Ins. ii. p. 218, n. 54.

♂, Aden.

We have received *G. stolida* from Abyssinia.

#### EUCLIDIIDÆ.

##### 69. TRIGONODES ACUTATA.

*Trigonodes acutata*, Guénée, Noct. iii. p. 283, n. 1728.

Aden.

This species is represented in the Museum by examples from Mauritius, Rodriguez, &c.

## 70. TRIGONODES ANFRACTUOSA.

*Ophiusa anfractuosa*, Boisduval, Faune Ent. de Madag. p. 104, n. 8, pl. 15. fig. 6.

Aden.

We have received this insect from Abyssinia.

## REMIGIIDÆ.

## 71. REMIGIA FRUGALIS.

*Noctua frugalis*, Fabricius, Ent. Syst. iii. 2, p. 138.

♂, Aden.

Common probably all over India and Africa; we have it from Kurrachee to Ceylon and from Sierra Leone to Madagascar.

## 72. REMIGIA CONVENIENS.

*Remigia conveniens*, Walker, Lep. Het. xiv. p. 1507, n. 19 (1857).

Aden (*Yerbury* and *Swinhoe*).

Probably abundant throughout Africa; we have it from Sierra Leone to Rodriguez.

## THERMESIIDÆ.

## 73. MAGULABA MÆSTALIS.

♀ *Magulaba mæstalis*, Walker, Lep. Het. Suppl. iv. p. 1126 (1865).

♂, Aden.

Walker's type was from Sierra Leone; he referred it, as a new genus, to the *Platydiidæ*, but as a fact it is allied to *Helia*, *Mulelocha*, *Daxata*, and *Mareura* (genera of the *Thermesiidæ*).

## HYPENIDÆ.

## 74. HYPENA JUSSALIS.

*Hypena jussalis*, Walker, Lep. Het. xvi. p. 52, n. 56 (1858).

Aden.

We have this species from the Congo and Natal.

## 75. HYPENA ABYSSINIALIS?

*Hypena abyssinialis*, Guénée, Delt. et Pyral. p. 39, n. 44.

Aden.

Excepting that I do not consider the palpi short in the species from Aden, it corresponds with Guénée's description of the Abyssinian insect.

## 76. HYPENA OBACERRALIS.

*Hypena obacerralis*, Walker, Lep. Het. xvi. p. 53, n. 58 (1858).

*Xanthoptera semilutea*?, Snellen, Tijds. voor Ent. 1872, pl. 5. fig. 11.

♂, Aden.

A very widely distributed species common to Asia and Africa; it appears to be abundant at Natal. Snellen's type is represented

without palpi, which would readily account for its being placed in the *Anthophilidæ*, though I fail to see any great similarity of this species to *Xanthoptera*. *H. obacerralis* varies not a little in the ground-colouring of its wings, the African specimens being usually (though not always) more luteous towards the base than those from Ceylon.

#### HERMINIIDÆ.

##### 77. HYDRILLODES INSIGNIS, sp. n.

Basal three fourths of primaries black, terminated by an elbowed white stripe from costa to inner margin; a broad cream-coloured belt across the basal third; external fourth sandy-brown, with two costal apical black quadrate spots, connected with the outer one of which is a >-shaped marking on external border, and below this again three black marginal dots; fringe cream-coloured; secondaries leaden-grey. Head and thorax black; metathoracic tufts and base of abdomen shining whity-brown; second to sixth abdominal segments leaden-grey with whitish posterior edges; anal tuft sordid testaceous; under surface yellowish, the upper surface markings almost obliterated. Expanse of wings 21 millim.

Aden.

Quite distinct in colouring from any species known to me; it somewhat resembles, both in colour and the general arrangement of its markings, *Heterochroma leucographa*, Snellen, from Sumatra.

#### ENNYCHIIDÆ.

##### 78. ENNYCHIA ARABICA, sp. n.

Upper surface deep purplish brown, almost black; primaries with a submarginal cream-coloured stripe, slightly widening and incurved towards the costa; a dentated jet-black marginal stripe produced by the confluence of a series of conical black spots; fringes of all the wings metallic leaden grey; palpi and collar below white; legs below, excepting the tarsi, whitish; wings nearly as above, excepting that the black dentated marginal stripe of the primaries is replaced by a slender black line, and consequently the submarginal stripe is wider. Expanse of wings 15 millim.

Aden.

Not nearly allied to any known species.

#### ASOPHIIDÆ.

##### 79. DESMIA AFFLICTALIS,

*Desmia afflictalis*, Guénée, Delt. et Pyral. p. 190, n. 125.

Aden.

Described from an Abyssinian example; also found on the western coast of Africa.

##### 80. HYMENIA FASCIALIS.

*Phalæna-Pyralis fascialis*, Cramer, Pap. Exot. iv. pl. 398. fig. O (1782).

Aden.

This species seems almost cosmopolitan. I have not seen

specimens from Europe, but should not be surprised if it turned up anywhere.

MARGARODIDÆ.

81. SYNCLERA TRADUCALIS.

*Synclera traducalis*, Zeller, Lep. Caffr. in Vetensk. Akad. Handl. p. 54 (1852).

Aden.

The African specimens are darker and the markings somewhat more sharply defined than in the type of *S. univocalis* from Ceylon.

82. NOORDA BLITEALIS.

*Noorda blitealis*, Walker, Cat. Lep. Het. xix. p. 979, n. 1 (1859).

*Scopula? subjectalis*, Walker, l. c. Suppl. vol. iv. p. 1472 (1865).

Aden.

Walker's types were from Ceylon and the Deccan. The genus *Noorda* is allied to *Glyphodes*, but the primaries are formed more nearly as in *Maruca*.

83. PHAKELLURA INDICA.

*Eudiotis indica*, Saunders, Zool. ix. p. 3070 (1851).

Aden (*Yerbury* and *Swinhoe*).

A common and widely distributed Indo-African species.

84. MARGARONIA TRANSVISALIS.

*Margarodes transvisalis*, Guénée, Delt. et Pyral. p. 304, n. 320.

Aden.

A common Indo-African species.

BOTYDIDÆ.

85. BOTYS NITETISALIS.

*Spilodes nitetisalis*, Walker, Cat. Lep. Het. xviii. p. 773, n. 17 (1859).

*Botys albidalis*, Walker, l. c. Suppl. iv. p. 1411 (1865).

Aden.

The types, from the Congo and India, are somewhat worn but perfectly recognizable.

86. EBULEA CATALAUNALIS.

*Botys catalaunalis*, Duponchel, Léop. viii. p. 330, pl. 232. fig. 8.

*Botys venosalis*, Walker, Lep. Het. Suppl. iv. p. 1401 (1865).

Aden.

We have this species from Europe, Asia, and Africa.

87. MECYNA DEPRIVALIS.

*Mecyna deprivalis*, Walker, Cat. Lep. Het. xix. p. 806, n. 7 (1859).

Aden.

Described from a Ceylonese example.

## SCOPARIIDÆ.

88. *SCOPARIA VINCTALIS*.

*Scopula vinctalis*, Walker, Lep. Het. Suppl. iv. p. 1476 (1865).  
Aden.

This has hitherto been known only as an Indo-Australian species.

## MACARIIDÆ.

89. *TEPHRINA SUBLIMBATA*, sp. n.

Upper surface pale sandy brownish, with the external third of the wings greyish, bounded internally by a nearly straight indistinct testaceous line; fringe whitish, striped with grey; remainder of the wing-surface transversely speckled with fine brown linear markings; a subcostal brown dash before the middle on all the wings; primaries with a marginal series of black dots: head brownish; collar bounded at the back by a dark red-brown stripe; external border of wings below dark smoky grey-brown; remainder of the wings much clearer and whiter than above: body below slightly yellowish, especially at the sides. Expanse of wings 29 millim.

Aden.

Though an ordinary-looking insect, there appears to be no described species nearly allied to this *Tephрина*.

## PHYCIDÆ.

90. *MELLA YERBURII*, sp. n.

Palpi short, compared with *M. zinckenella*; size, form, and neuraction similar: primaries dark leaden-grey; a narrow pure white subcostal stripe from base to costa near the apex; costal area also irrorated with white; fringe whitish, traversed by two grey stripes, the inner one broad and dark; secondaries semitransparent pearl-white; the veins, a narrow diffused external border, and a stripe near the base of the fringe brownish: head and collar brown, edged with pure white, thorax dark leaden-grey, tegulæ white-edged; abdomen pure white, anal tuft tipped with ochreous: primaries and costa of secondaries below silvery brownish white, remainder of secondaries pearly; fringes silky whitish; body below pearl white; anus ochreous. Expanse of wings 26 millim.

Aden.

## TINEIDÆ.

91. *TINEA SWINHOEI*, sp. n.

Nearest to *T. tapetzella*, but differing in the external border to the primaries and the less acute form of these wings. Primaries with the basal two fifths reddish "wood-brown," mottled with grey striæ, and speckled with black near the costal and dorsal margins; external border similarly coloured, partly bounded internally by an interrupted blackish streak and interrupted by four white submarginal spots; remainder of wing-surface white, transversely mottled, and beyond the cell banded with ash-grey; a black spot





6.



1.



11.



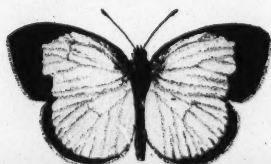
7.



2.



12.



3.



8.



13.



9.



4.



14.



10.



5.



15.

F. C. Moore del et lith.

Mintern Bros. imp.

NEW LEPIDOPTERA FROM KURRACHEE.





1.



7.



12.



2.



8.



13.



3.



9.



14.



4.



10.



15.



5.



11.



16.



6.

at the end of the cell; secondaries, thorax, and abdomen pale shining stramineous; head pure white; antennæ brownish; primaries below and pectus golden or bronzy-greyish without definite markings; venter and secondaries pale shining stramineous. Expanse of wings 19 millim.

Aden (*Yerbury* and *Swinhoe*).

Col. Swinhoe's specimen, though recognizable, is a good deal injured by being in spirit.

## 2. On Lepidoptera collected at Kurrachee.

By Lieut.-Col. C. SWINHOE, F.L.S., F.Z.S.

[Received October 4, 1884.]

(Plates XLVII.-XLVIII.)

Kurrachee does not afford a large field for the collection of Lepidoptera; its main features are sea, sand, and salt soil; the entire sea-coast of Sind, right up to Soumiani, the ancient seaport of Beloochistan, is a mere reclamation from the sea caused by the scour of the great river Indus, and has, besides babul trees (*Acacia arabica*), mimosa bushes, and the rank growth peculiar to sea-mud, no vegetation whatever, and even for many miles inland there is little but Babul and Euphorbia-bushes. In some years when rain falls, the grass springs up in the valleys, and some attempt at cultivation is made by the people; but during the time I remained at Kurrachee, from December 1878 up to August 1880, no rain whatever fell, and though I had a trained native collector with me the whole time, who collected regularly every day, the following is but a meagre list compared to what it would be for the same length of time in any other part of India.

The Lepidoptera of Kurrachee are, however, very interesting, more especially with reference to the *Teracoli*, many different and distinct species from widely ranging localities appearing to meet there.

Heavy rain fell at Kurrachee in the summer of 1882 and I employed a native collector there for some months, through the kind assistance of Mr. Murray, the Curator of the Municipal Museum, who dated and sent me the collections, and these collections contained, as will be seen, several species not observed during the years when no rain fell.

## RHOPALOCERA.

### NYMPHALIDÆ.

#### EUPLEINÆ.

#### 1. TIRUMALA LIMNIAE.

*Pap. limniace*, Cramer, *Pap. Exot.* i. pl. 59. f. D, E (1779).

At Kurrachee, in July 1882, after the unusually heavy rain of the summer of that year; is not usually found at Kurrachee or along the

coast; I did not take a single specimen during the whole of 1879 or 1880. Is common, however, in the interior of Sind.

## 2. SALATURA GENUZIA.

*Pap. genutia*, Cramer, Pap. Exot. iii. pl. 206. f. C, D (1782).

Four sent me by Mr. Murray, the Curator of the Kurrachee Museum, taken on the 28th of July, and two taken on the 2nd of August; the above note applies also to this species.

## 3. LIMNAS CHRYSIPPUS.

*Pap. chrysippus*, Linn. Mus. Ulr. p. 263 (1764).

Common at Kurrachee all the year through, as it is all through Sind.

## 4. LIMNAS DORIPPUS.

*Euplœa dorippus*, Klug, Symb. Phys. pl. 48. f. 1-5 (1845).

Never common at Kurrachee; but an odd specimen was taken by me personally in August, November, and December, 1879, and in January, June, and September, 1880, and one example sent me by Mr. Murray, taken in July 1882. I have no record of it from the interior. The Kurrachee examples show no differences from the few examples in my collection, which were taken in other parts of India—one at Poona, December 1882; one at Kahandalla, October 1882; and two in Bombay, August 1883; but they are not identical with my Aden examples, nearly all of which show more or less white on the upper surface of the hind wings, like Klug's type figured in his plate.

## 5. LIMNAS ALCIPPUS.

*Pap. alcippus*, Cramer, Pap. Exot. ii. pl. 127. f. E, F (1779).

Taken at Kurrachee—one in January 1879, and eleven in November and December, 1882. The white on the hind wings varies much: in some it is hardly sufficient to distinguish it from *L. chrysippus*.

## SATYRINÆ.

### 6. MELANITIS LEDA.

*Pap. leda*, Linn. Syst. Nat. i. 2, p. 773, n. 151 (1767).

One taken by me at Kurrachee; but the date was not recorded.

### 7. MELANITIS ISMENE.

*Pap. ismene*, Cramer, Pap. Exot. i. pl. 26. f. A, B (1775).

One in the Kurrachee Museum, labelled Kurrachee, but without date.

Both the above are apparently common in places in the interior (I have specimens of both kinds from Hydrabad); but are apparently very rare on the coast. I observed none at Soumiani, and Mr. Murray failed to send me any from Kurrachee after the heavy rain in 1882.

## NYMPHALINÆ.

## 8. ATELLA PHALANTA.

*Pap. phalanta*, Drury, Ill. Exot. Ent. i. pl. 21. f. 1, 2 (1773).

Two specimens in July 1882; was not observed throughout 1879-80.

## 9. PYRAMEIS CARDUI.

*Pap. cardui*, Linn. Faun. Suec. p. 276, n. 1054 (1761).

Plentiful in several months of the year. I took it in 1879 in January, February, July, August, and December, and in 1880 in June and July.

## 10. JUNONIA LEMONIAS.

*Pap. lemonias*, Linn. Mus. Ulr. p. 277 (1764).

Not observed by me either in 1879 or 1880; but the museum has an example said to be taken at Kurrachee.

## 11. JUNONIA HIERTA.

*Pap. hierta*, Fabr. Ent. Syst. Suppl. p. 424 (1798).

Taken by Mr. Murray in July 1882, one example sent me; not observed by me in 1879-80.

## 12. JUNONIA ORITHYA.

*Pap. orithya*, Linn. Mus. Ulr. p. 278 (1764).

Appears in April and May, but is not common.

## 13. JUNONIA ASTERIE.

*Pap. asterie*, Linn. Syst. Nat. i. 2, p. 769, n. 133 (1767).

One taken by me in November.

## 14. JUNONIA ALMANA.

*Pap. almana*, Linn. Mus. Ulr. p. 272 (1764).

The commonest species of the genus at Kurrachee; appears in January, April, and November.

## 15. HYPOLIMNAS BOLINA.

*Pap. bolina*, Linn. Mus. Ulr. p. 295 (1764).

July 1882, two specimens; was not observed throughout 1879-80.

## 16. HYPOLIMNAS MISIPPUS.

*Pap. misippus*, Linn. Mus. Ulr. p. 264 (1764).

Fairly common in the months of August and September. The female mimics *Limnas dorippus* more commonly than *L. chrysippus*.

## LYCÆNIDÆ.

## 17. POLYOMMATUS BÆTICUS.

*Pap. bæticus*, Linn. Syst. Nat. i. 2, p. 789, n. 226 (1767).

Large type appears plentifully in April and May, a few also taken in July.

## 18. LAMPIDES KANDARPA.

*Lycæna kandarpa*, Horsfield, Cat. Lep. E. I. C. p. 82, n. 17 (1829).

Kurrachee, July 1882.

## 19. CATOCHRYSOPS CNEJUS.

*Hesperia cnejus*, Fabr. Ent. Syst. Suppl. p. 430 (1798).

Large type, plentiful in August and September.

## 20. CATOCHRYSOPS CONTRACTA.

*Lampides contracta*, Butler, P. Z. S. 1880, p. 406, pl. xxxiv. f. 3.

Plentiful in August and September.

I believe this form to be only a seasonal variety of *C. cnejus*; but Mr. A. G. Butler, whose authority is much to be respected, thinks otherwise (P. Z. S. 1880, p. 407). I tried to breed them, but failed.

## 21. CATOCHRYSOPS ELLA.

*Catochrysops ella*, Butler, P. Z. S. 1881, p. 606.

A few specimens taken in December and January.

## 22. TARUCUS NARA.

*Lycæna nara*, Kollar, Hüg. Kaschm. iv. 2, p. 421 (1848).

Appears in great plenty at latter end of April and lasts until about the middle of August.

This species appears to be replaced in the north of Sind by the variety *Tarucus theophrastus*, Fabr., which has all the markings below in distinct and separate spots; all the examples received by me from Sukkur and Shikarpoor being of this type.

## 23. TARUCUS PLINIUS.

*Hesperia plinius*, Fabr. Ent. Syst. iii. 1, p. 284, n. 92 (1793).

Very plentiful in May, June, and July.

## 24. ZIZERA KARSANDRA.

*Polyommatus karsandra*, Moore, P. Z. S. 1865, p. 505, pl. xxxi. f. 7.

The commonest *Lycæna* in Kurrachee. It occurs in great plenty in April and May, a few in August, and then again in countless numbers throughout November and December.

## 25. ZIZERA MORA, n. sp. (Plate XLVII. fig. 2.)

Similar in shape and colour above and below to *Z. karsandra*, but larger; the markings below are very different and quite distinct. Fore wings with a black spot within the cell and a black mark at the end of the cell, and beyond this a row of six black thick longitudinal streaks between the veins, spear-shaped with the points outside running from near the costa to near the hinder margin, and

a small longitudinal subcostal streak slightly above and behind this row: hind wings with a subcostal spot one third from the base, a streak within the cell, another adjoining a mark at the end of the cell, and a whorl of streaks outside corresponding to the row on the fore wings—the first streak subcostal, very long, the second a little shorter, the next four less than half the length, and three more mere spots, each lessening in size; all the streaks and spots deep black, surrounded with white and distinctly separated from each other, giving the outer row of streaks on both wings the appearance of being stamped on a broad white band. Both wings with a sub-marginal row of spots slightly darker than the ground-colour of the wings on a greyish ground.

Kurrachee, June 1879, and again taken in June 1882. The Calcutta Museum has also a specimen received from Kurrachee. I thought at first it was merely an aberration of *Z. karsandra*; but as I have taken examples two years running, marked exactly similarly, and not at any other period of the year, it is clearly a distinct form.

26. *ZIZERA PYGMÆA*.

*Lycæna pygmæa*, Snellen, Tijdschr. Ent. xix. pl. 7. f. 3 (1876).

Appears in July, but is not common.

27. *CHILADES PUTLI*.

*Lycæna putli*, Kollar, Hügel's Kaschm. p. 422 (1848).

Muggur Pir, August, common.

28. *AZANUS ZENA*.

*Lycæna zena*, Moore, P. Z. S. 1865, p. 505, pl. 31. fig. 9.

July and August, fairly plentiful.

29. *APHNÆUS ACAMAS*.

*Lycæna acamas*, Klug, Symb. Phys. pl. 40. f. 7-9 (1834).

Common in January and February, 1879. Never got another specimen until July of the following year, when it again became very plentiful.

PAPILIONIDÆ.

PIERINÆ.

30. *TERIAS LÆTA*.

*T. læta*, Boisduval, Sp. Gén. i. p. 674, n. 36 (1836).

One example taken by me at Kurrachee in June 1879; I never procured another anywhere in the neighbourhood. The black border in the fore wings has a peculiar bronzy sheen; otherwise the specimen is identical with examples in my collection from other parts of India.

31. *TERIAS HECABE*.

*Pap. hecabe*, Linn. Mus. Lud. Ulr. p. 249 (1764).

Appears plentifully from April to August.

32. *TERIAS HECABEOIDES*.

*Ter. hecabeoides*, Mén. Cat. Mus. Petr., Lep. i. p. 85, pl. 2. f. 2 (1855).

Is also fairly plentiful during the summer months. I have specimens of both sexes in my collection, taken at Kurrachee in July and August.

33. *TERIAS ÆSIOPE*.

*Ter. æsiopæ*, Mén. Cat. Mus. Petr., Lep. i. p. 85, pl. 2. f. 3 (1855).

December and January. I took but few examples, however.

34. *TERIAS CURIOSA*, n. sp. (Plate XLVII. fig. 3.)

Kurrachee, August 1879.

Shaped like *T. hecabe*, with the peculiar yellow coloration of *T. venata*, Moore. Fore wings—costa black, with a broad black marginal band commencing just outside the middle of the costa, sinuous internally, and filling nearly the whole of the marginal area. Hind wing with the border as in *T. hecabeoides*. Below quite immaculate.

Expanse of wings  $1\frac{6}{10}$  inch.

35. *TERIAS PURREEA*.

*Ter. purreea*, Moore, P. Z. S. 1882, p. 252.

Is also scarce. I have thirteen in all, taken at Kurrachee in the months of December, January, and February.

36. *TERIAS ASPHODELUS*.

*Terias asphodelus*, Butler, P. Z. S. 1883, p. 151, pl. xxiv. f. 13.

Three examples in my collection, taken at Kurrachee in February 1880, exactly correspond with Mr. Butler's description and figure.

37. *TERACOLUS FAUSTUS*.

*Pap. fausta*, Olivier, Voy. l. Emp. Oth. Atl. pl. 33. f. 4, a, b (1801).

The common form of this group throughout Sind, extending also throughout Beloochistan and Southern Afghanistan. I have many specimens from Hyderabad, Sukkur, Quetta, and Kandahar. Appears at Kurrachee in January, August, and December.

38. *TERACOLUS PROTRACTUS*.

*Ter. protractus*, Butler, P. Z. S. 1876, p. 137.

Is rare at Kurrachee. I took a few in January and March, 1879. I saw it in great plenty on the Hubb River in August and again in November, and it is very common on the banks of the Indus above Hyderabad.

39. *TERACOLUS VESTALIS*.

*Ter. vestalis*, Butler, P. Z. S. 1876, p. 135, pl. vii. f. 10; 1881, p. 609.

Appears in great plenty from April to June.

40. *TERACOLUS PUELLARIS*.

*Ter. puellaris*, Butler, P. Z. S. 1876, p. 136, 1881, p. 609.

Is scarce on the coast, but the common form in the interior. I have numerous specimens from Hyderabad, but at Kurrachee it is to be seen only occasionally in April and May, and again in August and September.

41. *TERACOLUS OCHREIPENNIS*.

*Ter. ochreipennis*, Butler, P. Z. S. 1876, p. 136, 1881, p. 609.

Plentiful in December. *T. intermissus* is but a slight and not at all constant variety of *T. ochreipennis*.

42. *TERACOLUS PEELUS*.

*Teracolus peelus*, C. Swinhoe, P. Z. S. 1884, p. 439, pl. xxxix. fig. 9. Kurrachee, May and September.

43. *TERACOLUS DUBIUS*.

*T. dubius*, C. Swinh. P. Z. S. 1884, p. 439.

Kurrachee, July, August, and September.

44. *TERACOLUS DYNAMENE*.

*Pontia dynamene*, Klug, Symb. Phys. pl. 6. f. 15, 16 (1829).

From April to December, very common.

45. *TERACOLUS CARNIFER*.

*Ter. carnifer*, Butler, P. Z. S. 1876, p. 138, pl. vii. f. 8, 9.

November and December, common.

46. *TERACOLUS DULCIS*.

*T. dulcis*, Butler, P. Z. S. 1876, p. 157, pl. vii. f. 13.

*T. dirus*, Butler, l. c. fig. 11.

*T. eboreoides*, Butler, l. c. p. 158, pl. vii. f. 12.

*T. phoenius*, Butler, Ann. Nat. Hist. (4) xviii. p. 488 (1876).

Kurrachee, very common from April to August.

The types of *T. dulcis* came from Kattywar and North India, and Mr. Butler at the same time refers to a variety of both sexes from Sind.

The type of *T. dirus* came from Sind, being described as a female example. The types of both sexes of *T. eboreoides* are merely marked India (W. B. Farr). The types of *T. phoenius* came from Abyssinia.

I collected regularly every day at Kurrachee for a year and nine months, until the middle of August 1880, when I went up to

Kandahar, carefully recording captures each day ; and in separating species I found that, although all four of these forms seemed to be common at Kurrachee, I had still a number of examples that seemed to belong to none of them, and yet were closely allied to each.

On my return from field service, when passing through Kurrachee, I engaged a man to collect for me from April to August 1883, and Mr. Murray, the Curator of the Kurrachee Museum, very kindly agreed to have the collections brought to him daily for labelling.

The result is that, after setting out some hundreds of examples, I can show a perfect series from *T. phoenius* (of Sind) to *T. dulcis*. The normal form, I believe, must have been *T. phoenius*. It is beautifully and clearly marked, and is quite distinct from all the other species of the *T. danee* group. But as *T. dulcis* was first named, *T. phoenius*, as well as *T. dirus* and *T. choreoides*, must sink into synonyms.

The types of all four forms, when taken separately, appear to be quite distinct ; but from examination of my long series captured in the same months of the year at the same place, I think I have satisfied Mr. Butler that all are of the same species.

Similar variations, it will be seen, occur in the *T. etrida* group, also in the *T. eucharis* group, from Bombay and Southern India generally ; and it is worthy of remark that, although the variations seem to occur commonly in the group *Callosune*, the whole of the subgenus *Idmais* appears to be remarkably constant in all the yet known species.

#### 47. TERACOLUS IMMACULATUS.

*Teracolus immaculatus*, C. Swinhoe, P. Z. S. 1884, p. 443.

Kurrachee, August.

This is, I am inclined to think, only a spotless variety of *T. dulcis*.

#### 48. TERACOLUS SUBROSEUS.

*Ter. subroseus*, C. Swinhoe, P. Z. S. 1884, p. 443, pl. xl. figs. 6, 7.

Kurrachee, July and August.

A perfectly distinct and pretty species.

#### 49. TERACOLUS ETRIDA.

*Anthocaris etrida*, Boisduval, Sp. Gén. Léop. i. p. 576 (1836).

*Ter. purus*, Butler, P. Z. S. 1876, p. 160, n. 113, pl. vii. f. 14, 15.

Kurrachee, April to July, very common.

Examples vary much in size and in markings and general coloration. The hind wings of some of the males are almost immaculate, and many of the females are without the discal markings of the type ; but, as in the *T. dulcis* group, the number of intermediates found on an examination of a very large series makes it impossible to separate them.

50. *TERACOLUS LIMBATUS*.

*Ter. limbatus*, Butler, P. Z. S. 1876, p. 161.

Kurrachee, June 1880. One male example.

The deep brown, rather broad, sinuated band on the secondaries distinguishes this species from all the others in the group of orange-tips. But I am of opinion it is only an aberrant form of the foregoing.

51. *TERACOLUS BIMBURA*.

*Ter. bimbura*, Moore, P. Z. S. 1876, p. 161, pl. vii. f. 3, 4.

Kurrachee, December, January, and February.

52. *TERACOLUS PERNOTATUS*.

*Ter. pernotatus*, Butler, P. Z. S. 1876, p. 159, pl. vii. f. 1.

*T. farrinus*, Butler, P. Z. S. 1876, p. 159, pl. vii. f. 2.

Kurrachee, July, August, and September.

These cannot be separated, although there are perfectly typical forms of each. The intermediates found on an examination of a long series must convince any one that they are identical.

53. *PIERIS MESENTINA*.

*Pap. mesentina*, Cramer, Pap. Exot. iii. pl. 270. f. A, B (1782).

The pale type appears plentiful from February to May.

54. *PIERIS ZEUXIPPE*.

*Pap. zeuxippe*, Cramer, Pap. Exot. iv. pl. 362. f. E, F (1782).

One specimen taken by me in 1879, but the date was not recorded.

55. *CATOPSILIA PYRANTHE*.

*Pap. pyranthe*, Linn. Mus. Ulr. p. 245 (1764).

A few specimens taken in March, May, June, and December.

56. *CATOPSILIA THISORELLA*.

*Callidryas thisorella*, Bois. Sp. Gén. i. p. 609, n. 3 (1836).

March to May, common.

57. *CATOPSILIA PHILIPPINA*.

*Pap. philippina*, Cramer, Pap. Ex. iv. pl. 361. f. C, D (1782).

September to January, common.

58. *CATOPSILIA CROCALE*.

*Pap. crocale*, Cramer, Pap. Exot. i. pl. 55. f. C, D (1779).

I took one female in Kurrachee in 1879, now in my collection, date not recorded. I have received another, also a female, from Mr. Murray, taken by him in July 1882.

## PAPILIONINÆ.

## 59. PAPILIO (MENELAIDES) DIPHILUS.

*Pap. diphilus*, Esper, Ausl. Schmett. pl. 40 B. f. 1 (1785-98).

Kurrachee, July and August, plentiful.

## 60. PAPILIO (LAERTIAS) PAMMON.

*Pap. pammon*, Linn. Mus. Ulr. p. 189 (1764).

One pair in the Municipal Museum, said to have been taken at Kurrachee. The female of *P. diphilus* pattern not observed in Kurrachee by me.

## 61. PAPILIO (OPHEIDES) ERITHONIUS.

*Pap. erithonius*, Cram. Pap. Exot. iii. pl. 232. f. A, B (1782).

Kurrachee, common all the year through.

## HESPERIDÆ.

## 62. ISMENE ALEXIS.

*Pap. alexis*, Fabr. Syst. Ent. p. 533, n. 387 (1775).

Kurrachee, July 1882, one example taken; one also received from Hyderabad.

## 63. ISMENE CHROMUS.

*Pap. chromus*, Cramer, Pap. Exot. iii. pl. 284. f. E (1782).

One example received from Hyderabad.

## 64. PAMPHILA MATHIAS.

*Hesperia mathias*, Fabr. Ent. Syst. Suppl. p. 433 (1798).

Kurrachee, common at all seasons.

## 65. PAMPHILA BEVANI, Moore.

*Hesperia bevani*, Moore, P. Z. S. 1878, p. 688.

Seven examples received from Mr. Murray, taken at Kurrachee in July 1882.

## 66. PAMPHILA KARSANA.

*Hesperia karsana*, Moore, P. Z. S. 1874, p. 576, pl. 67. f. 6.

A common species at Kurrachee at all seasons of the year.

## 67. SARANGESA PURENDRA.

*Pyrgus purendra*, Moore, Cat. Lep. Mus. E. I. C. i. p. 250.

One example received from Hyderabad.

## 68. PYRGUS GALBA.

*Hesperia galba*, Fabr. Ent. Syst. iii. 1, p. 352, n. 337 (1793).

Kurrachee, June to October, common.

## 69. PYRGUS EVANIDUS.

*Pyrgus evanidus*, Butler, Ann. & Mag. Nat. Hist. March 1880, p. 223.

Kurrachee, January, February, and March, common.

70. *GOMALIA LITORALIS*, n. sp. (Plate XLVII. fig. 4.)

Kurrachee, July 1879, in the salt-marshes on the sea-shore.

Allied to *G. albofasciata*, Moore. Larger, and more marked with white above; costa arched, very nearly straight; ground-colour similar. Fore wing with a deep short white band occupying the space at the end of the cell, marked with black on the inner side, the black colour continued in the form of a band to the hinder margin, forming an elbow at the larger end of the white band; a black band near the base, edged with whitish; a lunular white spot on the disk, with a small white spot near it above; a white streak running down from the costa near the apex; costa greyish; fringe of the wing alternate brown and grey. Hind wings with a white spot at the base, a broad white discal band, and a deep white sinuous fringe. Below, the indications of the white markings are similar, but there is a white band at the base of the hind wings instead of a spot, and the entire surface of both wings is of a suffused pale bronzy-brown colour, with all the markings suffused and indistinct.

## HETEROCERA.

## SPHINGIDÆ.

1. *ACHERONTIA STYX*, Westwood, Cab. Orient. Ent. p. 88, pl. 42. f. 3.

Kurrachee, July and August.

Larvæ feed on potato, jasmine, colia, *Erythrina indica* and *Datura*. Colour varies in accordance with the kind of food they are found on: those feeding on potato were of a bright canary-yellow, with seven violet stripes, those on jasmine were of a darker colour, and those found on *E. indica* and *Datura* were green with purple stripes. All produced the same kind of moth, without any visible difference in the shade of colouring or markings; the larvæ and moths both make the same peculiar clicking noise when disturbed. Length 4 to 5½ inches. Larval stage 28 days; pupal stage varies from 1 to 4 months.

2. *DAPHNIS NERI*, Linn. Syst. Nat. i. 2, p. 798, no. 5.

Kurrachee, March, April, and May (1879-80).

Reared by me two years in succession (1879-80); larvæ feed on leaves of wild oleander and on flowers of the cultivated double garden oleander, not touching the leaves of this kind; has three broods in succession. I have also found the larva at Poona on *Tabernamontana* and *Coronaria*; the coloration of the moths at Poona is, however, much darker.

3. *DEILEPHILA LIVORNICA*, Hübner, Sphing. p. 96, no. 5, pl. 12. f. 65, pl. 23. f. 112.

Kurrachee, March and May (1879-80).

4. *CHÆROCAMPA CELERIO*, Linn. Syst. Nat. i. 2, p. 800, no. 12.

Kurrachee, November and December.

Larvæ feed on *Caladium*; there are three or four broods in suc-

cession: in Poona the first lot of larvæ in June, in the height of the monsoon rains, became pupæ in 14 or 15 days, and only remained in the larval stage 10 days; but the last lot in September were much more delicate and slower in growth. They fed for a month, and the perfect insect did not emerge until the following June, with the commencement of the monsoon rains.

5. *CHÆROCAMPA NESSUS*, Drury, Ill. Exot. Ins. ii. p. 46, pl. 27. f. 1.

One fine example taken at Kurrachee, October 1879.

6. *CHÆROCAMPA ELPENOR* (Linn.), Faun. Suec. p. 288, no. 1089.

One example received from the Municipal Museum, taken at Kurrachee, date not noted; it appears to me identical with the British type.

7. *CHÆROCAMPA OLDENLANDIÆ*, Fabr. Sp. Ins. ii. p. 148, no. 37. Kurrachee, December (1879-80).

8. *MACROGLOSSA STELLATARUM* (Linn.).

Kurrachee, July 1879, one example only taken. It is very plentiful in Beloochistan and Southern Afghanistan.

9. *CEPHANODES HYLAS*, Linn. Mant. i. p. 539.

Kurrachee, common in December.

#### ZYGENIDÆ.

10. *EUCHROMIA POLYMENA*, Linn. Syst. Nat. ii. p. 806, no. 40.

Several examples received by me in a collection made at Kurrachee in 1882 by Mr. Murray, but no date was recorded.

#### AGARISTIDÆ.

11. *ÆGOCERA VENULIA*, Cramer, Pap. Exot. ii. p. 107, pl. 165. f. D.

Kurrachee, July 1882.

#### LITHOSIIDÆ.

12. *DEIOPEIA PULCHELLA*, Linn. Syst. Nat. i. 2, p. 804, no. 349.

A variety was very plentiful at Kurrachee from January to May; typical *D. pulchella* appears in October and November (1879-80), but is not nearly so plentiful.

Var. *LOTRIX*, Cramer, Pap. Exot. ii. p. 20, pl. 109. f. E.

I took many examples of this form in the Hubb River, in the borders of Beloochistan, within 25 miles of Kurrachee, in November 1879, in company with typical *D. pulchella*, and received examples also from Kotree, North Sind, taken in March 1880.

Var. *THYTER*, Butler, Trans. Ent. Soc. 1877, p. 361.

Examples of this variety were taken in the Hubb by me in November 1879; and in the month following in company with the above; it is the common form in Beloochistan and Southern Afghanistan. I got many examples in the Bolan in June, at Quetta in May and September, and one example at Kandahar in November 1880. Types of all these varieties have been examined and identified by Mr. A. G. Butler.

#### LIPARIDÆ.

13. *ARTAXA PYGMÆA*, Moore, Pub. Asiat. Soc. Bengal, Atkinson Col. p. 48; P. Z. S. 1883, p. 156.

Kurrachee, February 1880, May, July 1879. Common.

14. *GOMENA SUBNOTATA*, Walker, Cat. Lep. Het. B. M. xxxii. p. 502.

Kurrachee, February 1880, August, November 1879.

#### LASIOCAMPIDÆ.

15. *TARAGAMA GANESA*, Lefebvre.

*Taragama ganesa*, Lefebvre, Zool. Journ. iii. p. 211 (1827); Moore, Cat. Col. E. I. M. ii. p. 427.

Kurrachee, May and September (1879-80).

Larva  $3\frac{1}{2}$  inches long, hairy, with down quite close to the skin; colour grey; feeds on *Acacia arabica*. They are night-feeders, hiding during the day in the crevices of the bark. Larval stage 50 to 56 days; pupal stage 21 to 24 days. Spins in a twig of any small plant near foot of the food-tree, or on a neighbouring wall; I have found many cocoons, but never one on the food-tree.

#### COSSIDÆ.

16. *BRACHYLIA ACRONYCTOIDES*, Moore, P. Z. S. 1879, p. 411, pl. 34. f. 4.

Kurrachee, May.

#### NOTODONTIDÆ.

17. *THIACIDES POSTICA*, Walker, Cat. Lep. Het. B. M. v. p. 1028.

Kurrachee, May and September 1879.

18. *PHRAGMATECIA FEDA*, n. sp. (Plate XLVII. fig. 1.)

Kurrachee, January and February.

Colour ashy grey; thorax and abdomen covered with long grey hairs, the latter conical, extending far beyond the wings. Antennæ of the male moderately pectinated throughout, of the female simple. Fore wings with a reddish testaceous band along the costa, extending along the outer border and inner margin, making a complete circle of the wing, and a band of the same colour from the base ex-

tending under, and up to the end of the discoidal cell, and then continuing upwards to the costa near the apex. Hind wings immaculate. Expanse of wings, ♂  $\frac{9}{10}$ , ♀  $1\frac{4}{10}$  inches.

### NOCTUÆ.

#### LEUCANIIDÆ.

19. *LEUCANIA LOREYI*, Duponchel, Hist. Nat. Léop. Fr. iv. p. 81, pl. 105. f. 7.

Kurrachee, February, April, May (1879-80). Common.

#### APAMIIDÆ.

20. *ILATTIA CEPHUSALIS*, Walker, Cat. Lep. Het. B. M. xvi. p. 209.

Kurrachee, November (1879-80).

21. *LAPHYGMA EXIGUA*, Hübner, Samml. eur. Schmett., Noct. f. 362.

Kurrachee, June.

#### NOCTUIDÆ.

22. *AGROTIS ARISTIFERA*, Guénée, Noct. i. p. 266, no. 426.

Kurrachee, February (1879-80). Common.

23. *CARADRINA SABULOSA*, n. sp. (Plate XLVII. fig. 6.)

Kurrachee, May 1879.

Fore wings pale greyish ochreous, markings brown, with two basal spots, one on the costa, a strigula near the base; one antemedial, one postmedial (with a spot in the costa between them), a suffused strigula before the apex, orbicular and reniform spots speckled and indistinct; a distinct small ringlet below the orbicular spot, and a much larger one in the upper part of the disk; a brown shade in the basal half of the hinder margin, a sinuous line on the outer margin, with minute white spots on the veins, and the brown line running partly inwards, on the veins; fringe brownish. Hind wings silvery white, with a suffused brown border; fringe silvery white. Underside silvery white, fore wings with brownish centre and outer border; hind wings with brownish border. Expanse of wings 1 inch.

24. *CARADRINA VENOSA*, Butler, Ent. Month. Mag. vol. xvii. p. 7 (1880).

Kurrachee, November.

25. *CARADRINA INSIGNATA*, Walker, Cat. Lep. Het. B. M. x. p. 295.

Kurrachee, June, May, July, and November.

26. *SPELOTIS UNDULANS*, Moore, Sci. Res. Yark. Miss., Lep. pl. 1. f. 10 (1876); P. Z. S. 1881, p. 617.

Kurrachee, November.

## ORTHOSIIDÆ.

27. *ORTHOSIA INFREQUENS*, n. sp. (Plate XLVII. fig. 11.)

Kurrachee, July.

Dull fawn-colour: fore wings with the outer border slightly toothed; orbicular and reniform spots distinct, with greyish rings; a deep outer border darker than the ground-colour, with the veins showing lighter; hind wings paler than the fore wings, with a gloss on them; outer border as in the fore wings. Expanse of wings  $1\frac{2}{10}$  inch.

## XYLINIDÆ.

28. *JARASANA LATIVITTA*, Moore, Desc. Lep. in Atkinson Col., vol. ii. p. 132.

Kurrachee, July 1879. One example.

## ACONTIIDÆ.

29. *XANTHODES INNOCENS*, Walker, Cat. Lep. Het. B. M. xv. p. 1752.

Kurrachee, October and November, 1879 and 1880.

30. *XANTHODES ARCUATA*, Walker, Cat. Lep. Het. B. M. xii. p. 779.

Kurrachee, February.

31. *ACONTIA HORTENSIS*, n. sp. (Plate XLVII. fig. 7.)

Kurrachee, September.

Allied to *A. solaris* of Europe, but considerably smaller. Fore wings chocolate-brown, speckled with white at the base; a broad white band before the middle; a large square white spot on the costa before the apex; a sinuous submarginal white line, the margin also marked with white. Hind wings pale chocolate-colour, with the border slightly darker. Underside very pale bronzy chocolate, with the white markings showing through. Expanse of wings  $1\frac{9}{10}$  inch.

32. *ERASTRIA FUTILIS*, n. sp. (Plate XLVII. fig. 8.)

Kurrachee, March.

Allied to *E. scitula*. Silvery grey; palpi and eyes black: fore wings with a basal and antemedial line brown, the latter bordered with grey outwardly, beyond this the whole of the wing is more or less blackish brown, with the reniform stigma black, and with a post-medial and submarginal wavy white line, both expanding towards the costa, making the apical portion of the wing whitish; marginal line black. Hind wing with the lower part of the basal third suffused with brownish, with a brownish diffused discal band, and with some brownish in the margin; marginal line black. Expanse of wings  $1\frac{6}{10}$  inch.

## HELIOTHIDÆ.

33. *HELIOTHIS ARMIGERA*, Hübner, Noct. pl. 79. f. 370.

Kurrachee, in great numbers in January 1879–1890.

Var. *PELTIGERA*, Denis, Wien, Verz. p. 89, n. 2; Walker, xi. p. 683.

Kurrachee, July 1882. One example.

This is the common form across the Hubb River in Beloochistan. I also found it in great numbers at Ispingil in June, and at Quetta in September.

34. *ADISURA LEUCANIOIDES*, Moore, P. Z. S. 1881, p. 368.

Muggur Pir, 18 miles from Kurrachee, August 1880.

## ANTHOPHILIDÆ.

35. *ACANTHOLIPES AFFINIS*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 225 (1880).

Kurrachee, February, May, November, and December, 1879, 1880. Very plentiful.

36. *ANTHOPHILA ZAMIA*, n. sp. (Plate XLVII. fig. 12.)

Kurrachee, April.

Thorax and fore wings pinkish cinereous; body paler; fore wings with a central and an outer wavy white line, the latter bordered with blackish on the inner side, and the space between that and the central line paler than the rest of the wing; marginal line brown; fringe interlined—brown, white, and brown. Hind wings pinkish white, with a discal sinuous white line, a marginal double brown line, and cilia as in fore wings. Expanse of wings 1 inch.

37. *ANTHOPHILA BULLA*, n. sp. (Plate XLVII. fig. 9.)

Kurrachee, January.

Pale greenish grey; head and sides of thorax white; a black spot on the fore part of the thorax; costa of fore wings and the veins dark, otherwise the wings are unmarked. Expanse of wings  $\frac{6}{10}$  inch.

38. *MICRA DEROGATA*, Walker, Cat. Lep. Het. B. M. xii. p. 825.

Hubb River, August.

39. *MICRA CHALYBEA*, n. sp. (Plate XLVII. fig. 10.)

Kurrachee, January.

Colour steel-grey; costa greenish grey; a medial slightly sinuous white line on the fore wing, bounded by a greenish-grey band on the inner side; outer third suffused with greenish grey, with some subapical marks, and a marginal line of a deeper colour; fringe greenish grey. Hind wing pale steel grey, slightly darker towards the border, with a dark marginal line; fringe grey. Expanse of wings  $\frac{6}{10}$  inch.

40. *MICRA FURIA*, n. sp. (Plate XLVII. fig. 13.)

Kurrachee, September.

Brownish grey; apex of wings very acute; outer border straight, oblique, veins prominent, otherwise the wings are unmarked. Expanse of wings  $1\frac{2}{3}$  inch.

41. *MICRA BALUX*, n. sp. (Plate XLVII. fig. 14.)

Kurrachee, April and August.

Bright golden brown; head pale pinkish; wings and body quite unmarked. Expanse of wings  $1\frac{2}{3}$  inch.

## PLUSIIDÆ.

42. *PLUSIA VERTICILLATA*, Guénée, Noct. ii. p. 344, no. 1168.

Kurrachee, January, February, and November, 1879-1880. Very plentiful.

43. *PLUSIA EXTRAHENS*, Walker, Cat. Lep. Het. B. M. xii. p. 929.

Kurrachee, March and July, 1879-1880.

## CALPIDÆ.

44. *ORÆSIA VAGABUNDA*, n. sp. (Plate XLVII. fig. 5.)

Kurrachee, May.

Reddish cinereous; antennæ of the male pectinated for two thirds of its length, of the female simple; abdomen pale ochreous cinereous: fore wings with a central diffused brownish-red band, which is retracted towards and stops short of the costa; an outer wavy band of the same colour from two thirds of the hinder margin up to the apex, margined with ochreous cinereous in the outer side, the whole surface of the wing dotted with brown atoms of various sizes. The female is paler than the male, and has all the veins marked with brown at the outer margin; hind wings of the male white, slightly suffused with pinkish ochreous towards the outer margin; in the female the hind wing is of a pale reddish-cinereous colour, slightly darker at the outer margin. Expanse of wings, ♂ 1, ♀  $1\frac{2}{3}$  inch.

## GONOPTERIDÆ.

45. *GONITIS INVOLUTA*, Walker, Cat. Lep. Het. B. M. xiii. p. 1003.

Kurrachee, June 1879-1880. Common.

## POLYDESMIDÆ.

46. *PANDESMIA FUGITIVA*, Walker, Cat. Lep. Het. B. M. xiv. p. 1365.

Kurrachee, March to September, 1879-1880. The commonest moth in Kurrachee.

47. *PANDESMIA SIMILATA*, Moore, P. Z. S. 1883, p. 24.

Shikapore, April 1879.

Two chrysalides received by post, hatched two days after arrival, producing one of each sex.

48. *PANDESMIA DEVIA*, n. sp. (Plate XLVIII. fig. 3.)

Kurrachee, June.

In coloration and markings it has the general appearance of a large *Heliothis armigera*. Body whitish grey: fore wings ochreous ash colour; costa with a few brown marks near the base, a small orbicular ringlet; reniform stigma large, excavated anteriorly; an inner and an outer latitudinal thin slightly sinuous line, a broad grey band right across the marginal area, suffused inwardly and bordered with a sinuous white line outwardly, with a black spot on this line towards the apex of the wing, with brown lines on the veins extending from this white line to the outer border; fringe brown. Hind wings pale ochreous grey, with a very broad, brown discal band, and a somewhat suffused lighter brown marginal border; fringe white. Underside pale whitish grey, slightly brown on the borders and costa, with a pale brown discal band through both wings. Expanse of wings  $1\frac{5}{8}$  inch.

#### HOMOPTERIDÆ.

49. *HOMOPTERA VETUSTA*, Walker, Cat. Lep. Het. B. M. xxxiii. p. 875.

Kurrachee, April and May, 1879-1880. Common.

#### HYPOGRAMMIDÆ.

50. *SELEPA DOCILIS*, Butler, P. Z. S. 1881, p. 619.

Kurrachee, May and November, 1879-1880. Hubb River, November 1879.

51. *OTHORA ÆNEA*, n. sp. (Plate XLVIII. fig. 1.)

Kurrachee, July.

Æneous brown, paler beneath and more bronzy; fore wings above with a basal wavy band which stops short of the costa, and a central wavy band which passes across the reniform stigma, of a darker colour; otherwise both wings above and below are unmarked. Expanse of wings 1 inch.

#### BENDIDÆ.

52. *HAMODES AURANTICA*, Guénée, Noct. iii. p. 203, no. 1603.

Jacobabad, January 1879.

#### OPHIUSIDÆ.

53. *LAGOPTERA MAGICA*, Hübner, Samml. exot. Schmett. iii. p. 32, no. 268, f. 535, 536.

Kurrachee.

Is not uncommon; but unfortunately I have no note of dates. I have found the larvæ feeding on *Quisqualis indica*.

54. *OPHIODES SEPERANS*, Walker, Cat. Lep. Het. xiv. p. 1357.  
Kurrachee.

I took one example in my house in 1879, but the date is not recorded; the larva of this species was also found feeding on *Quisqualis indica* in Poona, where it is quite common.

55. *OPHIODES TUMIDILINEA*, Walker, Cat. Lep. Het. xiv. p. 1433.  
Kurrachee; no date recorded.

56. *ACHÆA MELICERTE*, Drury, Ins. i. p. 46, pl. 23. f. 1.

Was very common in July 1882, after the heavy rain, and I received a number from Mr. Murray. I did not, however, find any in either 1879 or 1880. The larvæ feed on *Ricinus communis*. I also brought up some in Bombay on wild cucumber. Length  $2\frac{1}{4}$  to  $2\frac{1}{2}$  inches; colour varies, some are deep purplish black, some reddish, some orange-tinted; larval stage 21 to 24 days; pupal stage 18 to 21 days.

57. *GRAMMODES AMMONIA*, Cramer, Pap. Exot. iii. p. 98, pl. 250. f. D.

Common in July.

58. *GRAMMODES STOLIDA*, Fabr. Sp. Ins. ii. p. 218, no. 54.

Common in June and July; in great abundance again in November.

59. *OPHIUSA ALBIVITTA*, Guénée, Noct. iii. p. 271, no. 1707.

Was common in Kurrachee in the summer of 1879, but I have no record of dates.

60. *TRIGONODES HIPPIASIA*, Cramer, Pap. Exot. iii. p. 99, 250. f. E.

Very common. I took it in June and in September and October.

#### REMIGIDÆ.

61. *REMIGIA FRUGALIS*, Fabr. Ent. Syst. iii. 2, p. 138.

A few taken in August; common in October and November.

62. *REMIGIA ARCHESIA*, Cramer, Pap. Exot. iii. p. 145, pl. 273. f. F, G.

Was not observed during 1879-80, but appeared in great abundance after the rain in July 1882.

63. *REMIGIA AREFACTA*, n. sp. (Plate XLVIII. fig. 2.)

Kurrachee, May.

Allied to *R. multilinea* and also to *R. hansalii*. Palpi pubescent, third joint lanceolate, much longer than the second, ascending; antennæ slender; abdomen whitish cinereous; thorax and general colour of both wings ochreous ashy, irrorated with ochreous brown;

an ochreous-brown band running through the disk of both wings, from the costa near the apex of the fore wings to the anal angle of the hind wings; outer portion of wings clouded with dusky ochreous, a marginal sinuous brown line, with brown points; fringe broad, interlined in five parts, whitish and brown alternately. Expanse of wings  $1\frac{1}{10}$  inch.

#### THERMESIIDÆ.

64. *AZAZIA RUBRICANS*, Boisd. Faun. Léop. Mad. p. 106, no. 11, pl. 16. f. 1.

Common in November in company with a very dark, nearly black variety.


#### HERMINIIDÆ.

65. *RIVULA SERICEALIS*, Denis, Wien. Verz. p. 122, n. 18.

Common throughout the year.

66. *RIVULA FLAVONIGRA*, n. sp. (Plate XLVII. fig. 15.)

Kurrachee, March.

Head, antennæ, fore part of the thorax, and outer three fourths of the fore wings black; remainder of the thorax, abdomen, and basal portion of the fore wings (except the costa, which is also black) dull yellow; segments of the abdomen washed with pale brown; anal tuft ochreous; all the yellow parts more or less marked with black: fore wings with three spots on the costa near the apex, the marginal points "reniform," marked thus , the orbicular double dots, and many minute atoms all over the black portion of the wing, yellow; fringe black: hind wings white, pale brownish towards the border, marginal line brown, fringe white. Expanse of wings  $\frac{5\frac{1}{2}}{10}$  inch.

67. *BYTURNA DIGRAMMA*, Walker, Cat. Lep. Het. B. M. xxxiv. p. 1170.

Kurrachee, June.

68. *MARIMATHA LACTEA*, n. sp. (Plate XLVIII. fig. 7.)

Kurrachee, May.

Glossy yellowish cream-colour, abdomen and hind wings paler, fore wings with black points, otherwise quite unmarked.

Expanse of wings  $\frac{9}{10}$  inch.

69. *MYANA SOPORA*, n. sp. (Plate XLVIII. fig. 4.)

Kurrachee, January and March.

Ochreous cinereous, irrorated with brown, costa with brown marks, reniform mark brown, lunular, a pale greyish suffused central band, a submarginal band blackish towards the apex, and a macular marginal band pale greyish, with black points on the veins between; fringe ochreous grey, with pale ochreous-brown border. Hind wings with the general pattern like the fore wings, but more indistinct. Thorax with a pale greyish-brown band in front. Expanse of wings 1 inch.

70. *MYANA ATROMACULA*, n. sp. (Plate XLVIII. fig. 5.)

Kurrachee, February.

Ochreous cinereous; thorax with a brownish band in front; fore wings—costa brownish with black dots, outer third brownish suffused inwardly, with black marginal points, and black on the veins; a large reniform black spot, and two large deep black longitudinal streaks near the base, a wavy double ill-defined outer line. Hind wings same general colour as the fore wings, with a discal suffused brownish band. Expanse of wings 1 inch.

## PYRALES.

## PYRALIDÆ.

71. *HYPOTIA VULGARIS*, Butler, P. Z. S. 1881, p. 621.

Common from March to May and from August to November.

72. *HYPOTIA VAFERA*, n. sp. (Plate XLVIII. fig. 8.)

Kurrachee, April.

Allied to the preceding. General colour pale chocolate-grey; abdomen paler, with each segment distinctly marked with silvery grey: fore wings with the basal third pale chocolate, bounded outwardly with a darker, slightly waved line, succeeded by a white band; a dark chocolate band beyond the middle, running from the centre of the hinder margin to the costa near the apex, the central space between these bands much paler than the rest of the wing; outer third of the wing same colour as the basal third, with a white deeply waved band joining the last band at the costa; a chocolate spot at the end of the cell: hind wings whitish, with a deep diffused, pale greyish-chocolate border, with a wavy white band running through it; fringe whitish, with chocolate edges. Expanse of wings  $\frac{9\frac{1}{2}}{10}$  inch.

73. *HYPOTIA RUBELLA*, n. sp. (Plate XLVIII. fig. 9.)

Kurrachee, January and August.

Body and basal third of fore wings chocolate-grey; rest of the wing very much paler, nearly white; two white lines—one bordering the basal third, edged inwardly with brown, and nearly straight, the other very wavy, commencing at the costa near the apex, and terminating at the centre of the hinder margin, and edged with brown outwardly; some darker shades of colour near this line; marginal line white with black spots; fringe white. Hind wings greyish white, with a thin brown marginal line; fringe white. Expanse of wings  $\frac{7}{10}$  inch.

74. *PYRALIS GERONTESALIS*, Walker, Cat. Lep. Het. B. M. xix. p. 896.

Kurrachee, January.

75. *PYRALIS UBERALIS*, n. sp. (Plate XLVIII. fig. 10.)

Kurrachee, May.

Fore wings and thorax greyish brown striated with white; head  
 PROC. ZOOL. SOC.—1884, No. XXXVI. 36

white; a white line across the thorax in front; abdomen whitish; legs pure white: fore wings with two white marks at the base, a curved white line from the costa near the base to the centre of the hinder margin; three white lines all running inwards from the apex—one curved, near the costa, nearly joining the last-mentioned line, one submarginal and straight, and one slightly sinuous and close to the submarginal line, terminating on the outer two thirds of the hinder margin; marginal line greyish brown, double; fringe grey, margined with greyish brown. Hind wings white, slightly coloured towards the margin, with a double greyish-brown marginal line; fringe pure white. Expanse of wings  $1\frac{5}{16}$  inch.

## ASOPHIDÆ.

76. *HYMENIA FASCIALIS*, Cramer, Pap. Exot. iv. p. 236, pl. 398. f. O.

Common from June to August.

77. *LEUCINODES ORBONALIS*, Guénée, Delt. et Pyral. p. 223, n. 187.

Larkana, July.

## STENIIDÆ.

78. *DIASEMIA GEOMETRALIS*, Guénée, Delt. et Pyral. p. 278 (1854).

Common in December.

## HYDROCAMPIDÆ.

79. *HYDROCAMPA TENERA*, Butler, P. Z. S. 1883, p. 167.

Kurrachee, January and May.

80. *OLIGOSTIGMA INCOMMODA*?, Butler, P. Z. S. 1881, p. 180.

Kurrachee, November.

81. *PARAPONYX AFFINIALIS*, Guénée, Delt. et Pyral. p. 270, n. 279.

Kurrachee, May.

## HERCYNIDÆ.

82. *APORODES MELEAGRISALIS*, Walker, Cat. Lep. Het. B. M. xvii. p. 324.

Common from February to April.

## SPILOMELIDÆ.

83. *ZEBRONIA AUROLINEALIS*, Walker, Cat. Lep. Het. B. M. xvii. p. 478.

July and August.

## MARGARODIDÆ.

84. *PYGOSPILA TYRES*, Cramer, Pap. Exot. iii. p. 124, pl. 263. f. C.

One example taken at Kurrachee in 1879, date not recorded.

85. *PHAKELLURA INDICA*, Saunders, Zool. ix. p. 3070.

Very common in July and August.

86. *GLYPHODES UNIVOCALIS*, Walker, Cat. Lep. Het. B. M. xvii. p. 499.

Common in November and December.

#### BOTIDIDÆ.

87. *GODARA COMALIS*, Guénée, Delt. et Pyral. p. 369 (1854).

Common at Kurrachee in January, May, and December; also taken at Muggur Pir in August.

88. *GODARA INCOMALIS*, Guénée, Delt. et Pyral. p. 369 (1854).  
Kurrachee, May and December.

89. *SCOPULA PALMALIS*, n. sp. (Plate XLVIII. fig. 11.)

Kurrachee, November.

Allied to *S. massalis*. Silver-grey; head, palpi, antennæ, and fore part of the thorax chestnut-red: fore wings with the costa, spot at the end of the cell, a number of marks near the base, and the outer third of the wing chestnut-red; a silver-grey discal line and a brown marginal line; fringe chestnut-red: hind wings silver-grey, suffused with reddish, a discal chestnut band, some reddish on the outer border, and a macular chestnut marginal line; fringe white. Expanse of wings  $\frac{7}{10}$  inch.

90. *NYMPHULA INTERPUNCTALIS*, Hübner, Pyral. ii. p. 19, fig. 128.

Kurrachee, May to July. Muggur Pir, August.

91. *EBULEA CATALAUNALIS*, Duponchel, Lép. de France, viii. p. 330, pl. 232. f. 8.

Kurrachee, May.

92. *BOTYS ISPASALIS*, Walker, Cat. Lep. Het. B. M. xviii. p. 652.

Common from May to September.

93. *BOTYS ABSTRUSALIS*, Walker, Cat. Lep. Het. B. M. xviii. p. 663.

Kurrachee, April, July, and November.

94. *BOTYS ÆDIPODALIS*?, Walker, Cat. Lep. Het. B. M. xviii. p. 569.

Kurrachee, December.

#### SCOPARIIDÆ.

95. *STENOPTERYX HYBRIDALIS*, Hübner, Pyral. pl. 17. f. 114.  
January, February, May, and November. Very common.

96. *SCOTOMERA TRISTIS*, Butler, P. Z. S. 1881, p. 623.  
Kurrachee, March. Hubb River, November.

PTEROPHORIDÆ.

97. *PTEROPHORUS CONGRUALIS*, Walker, Cat. Lep. Het. B. M.  
xxx. p. 943.  
Kurrachee, February and May.

GEOMETRITES.

ENNOMIDÆ.

98. *HYPERYTHRA SWINHOEI*, Butler, Ann. & Mag. Nat. Hist.  
ser. 5, vol. v. p. 223 (1880).  
Kurrachee, May and November.
99. *HYPERYTHRA PHANTASMA*, Butler, P. Z. S. 1881, p. 615.  
Kurrachee, February.

BOARMIIDÆ.

100. *HYPOCHROMA PSEUDO-TERPNARIA*, Guénée, Phal. i. p. 276,  
n. 436.  
January and June.
101. *HYPOCHROMA DISPENSATA*, Walker, Cat. Lep. Het. B. M.  
xxi. p. 435.  
January and June.

GEOMETRIDÆ.

102. *NEMORIA PRUINOSA*, Butler, Ann. & Mag. Nat. Hist. ser. 5,  
vol. v. p. 224 (1880).  
January, May, September, and December. Very common.
103. *NEMORIA FREQUENS*, Butler, P. Z. S. 1881, p. 616.  
April and November.
104. *THALERA DIATOMATA*, Walker, Cat. Lep. Het. B. M. xxvi.  
p. 1616.  
November and December.

IDÆIDÆ.

105. *IDÆA DISTRACTA*, Butler, P. Z. S. 1881, p. 616.  
Very common in May.
106. *IDÆA REMOTATA*, Walker, Cat. Lep. Het. B. M. xxii. p. 748.  
Kurrachee, June.
107. *IDÆA JACTA*, n. sp. (Plate XLVIII. fig. 12.)  
Kurrachee, May.  
Pale pinkish white, irrorated with brown atoms; fore wings with

the costa brownish ; a basal interrupted line, not reaching the costa, and very indistinct ; antemedial, medial, and postmedial wavy lines brown ; hind wings with only the medial and postmedial lines ; fringe pure white. Expanse of wings  $1\frac{6}{10}$  inch.

108. *IDÆA INVALIDA*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 439 (1879).

Kurrachee, May and December.

109. *IDÆA INDUCTATA*, Walker, Cat. Lep. Het. B. M. xxiii. p. 792.

Kurrachee, May, November, and December.

110. *IDÆA ACTUARIA*, Walker, Cat. Lep. Het. B. M. xxiii. p. 752.

Kurrachee, May.

#### FIDONIIDÆ.

111. *TEPHRINA PEREMPTARIA*, Walker, Cat. Lep. Het. B. M. xxiii. p. 929.

Kurrachee, November and December.

112. *TEPHRINA LITHINA*, Butler, P. Z. S. 1883, p. 171.

January and March.

113. *TEPHRINA ARENARIA*, n. sp. (Plate XLVIII. fig. 13.)

Kurrachee, December. Common.

Allied to *T. arenacearia*. Pale whitish bone-colour, slightly irrorated with brown atoms ; costa thinly brown, a brown dot at the end of the cell ; both wings with four faint brown lines :—1, interior and retracted towards the costa ; 2, medial ; 3, exterior and double, and darker than the others ; 4, marginal, slightly diffuse, with black points in the veins ; there is also another shadowy line between the double and the marginal line, and which joins the double line at the costa ; hind wing slightly angulated in the centre of the outer border. Expanse of wings  $1\frac{2}{10}$  inch.

114. *TEPHRINA STRENUATARIA*, Walker, Cat. Lep. Het. B. M. xxvi. p. 1647.

May to July, November to December. Very common.

115. *FIDONIA ALBOFASCIA*, n. sp. (Plate XLVIII. fig. 14.)

Kurrachee, September.

Body pale cinereous tinged with chocolate-brown ; antennæ moderately pectinated, except towards the tips ; ground-colour of the wings whitish cinereous, basal third densely irrorated with chocolate-brown ; a broad milk-white band across the centre of both wings, bordered on the inside by a chocolate-brown band, and on the outer side ; the rest of the wing is coloured chocolate-brown, with the whitish ground-colour of the wing showing through here and there. Expanse of wings  $1\frac{6}{10}$  inch.

116. *STERRA SACRARIA*, Linn. Syst. Nat. i. (2) p. 863 (1766).  
Common in November.

## EROSIIDÆ.

117. *EROSIA HYPERBOLICA*, n. sp. (Plate XLVIII. fig. 15.)

Kurrachee, May.

General colour pale reddish cinereous; eyes black; body slender, cylindrical; fore wings with the costa straight, long, apex rounded, hinder margin very short, notched behind the angle, outer margin round, slightly toothed; hind wings small, with the outer margin produced into two long teeth. The entire surface of both wings deeply irrorated with reddish ochreous; a basal, medial, and outer band of dark reddish ochreous; a semidiaphanous white spot in the centre of the medial band of the fore wings; an elongated semidiaphanous latitudinal streak in the centre of the same band in the hind wings; fringe whitish. Expanse of wings  $1\frac{2}{10}$  inch.

## CRAMBICES.

## CRAMBIDÆ.

118. *SCIRPOPHAGA DEGENERELLA*, Walker, Cat. Lep. Het. B. M. xxviii. p. 524.

Jemedar Ke Landi, March.

119. *CRAMBUS ZONELLUS*, n. sp. (Plate XLVIII. fig. 16.)

Kurrachee, May.

Allied to *C. decolorellus*. Yellowish fawn-colour; abdomen whitish; last joint of the labial palpi very long,  $\frac{1}{10}$  inch; abdomen extending somewhat beyond the wings. Fore wings acute, outer border nearly straight, slightly oblique, marginal points black; fore wings darker towards the costa and outer border, a faint brown streak along the subcostal nervure, a black dot at the end of the cell, two brown spots below, on the submedian nervure, and a brown shadowy band running in from the apex, towards the centre of the hinder margin, but stopping half way; hind wings whitish. Expanse of wings  $1\frac{8}{10}$  inch.

## NYCTEOLIDÆ.

120. *EARIAS TRISTRIGOSA*, Butler, P. Z. S. 1881, p. 614.

Very common throughout the year.

121. *EARIAS FRONDOSANA*, Walker, Cat. Lep. Het. B. M. xxvii. p. 204.

Kurrachee, February.

## TORTRICIDÆ.

122. *PEDISCA DECOLORANA*, Freyer, Neuere Beiträge, 318, 5 (1831-58).

February and May.

## PHYCIDÆ.

123. *MELLA ZINCKENELLA*, Treitschke, Schmett. Eur. ix. 1. p. 20 (1832).

Very common in April and May.

124. *PEMPELIA ILELLA*, n. sp. (Plate XLVIII. fig. 6.)

Kurrachee, February, March, and May. Common.

Allied to *P. cautella*, from Ceylon. Fawn-colour; eyes black; thorax and fore wings clouded with brownish, fringe grey; abdomen paler; hind wings pale greyish, semihyaline, with a brownish marginal line, fringe white. Expanse of wings  $\frac{8}{10}$  inch.

## EXPLANATION OF THE PLATES.

## PLATE XLVII.

- Fig. 1. *Phragmataecia feda*, n. sp., p. 515.  
 2. *Zizera mora*, n. sp., p. 506.  
 3. *Terias curiosa*, n. sp., p. 508.  
 4. *Gomalia litoralis*, n. sp., p. 513.  
 5. *Oræsia vagabunda*, n. sp., p. 519.  
 6. *Caradrina sabulosa*, n. sp., p. 516.  
 7. *Acontia hortensis*, n. sp., p. 517.  
 8. *Erastria futilis*, n. sp., p. 517.  
 9. *Anthophila bulla*, n. sp., p. 518.  
 10. *Micra chalybea*, n. sp., p. 518.  
 11. *Orthosia infrequens*, n. sp., p. 517.  
 12. *Anthophila zamia*, n. sp., p. 518.  
 13. *Micra furia*, n. sp., p. 519.  
 14. — *balux*, n. sp., p. 519.  
 15. *Rivula flavonigra*, n. sp., p. 522.

## PLATE XLVIII.

- Fig. 1. *Othora ænea*, n. sp., p. 520.  
 2. *Remigia arefacta*, n. sp., p. 521.  
 3. *Pandesma devia*, n. sp., p. 520.  
 4. *Myana sopora*, n. sp., p. 522.  
 5. — *atromacula*, n. sp., p. 523.  
 6. *Pempelia ilella*, n. sp., p. 529.  
 7. *Marimatha lactea*, n. sp., p. 522.  
 8. *Hypotia vasera*, n. sp., p. 523.  
 9. — *rubella*, n. sp., p. 523.  
 10. *Pyrætis uberælis*, n. sp., p. 523.  
 11. *Scopula palmaris*, n. sp., p. 525.  
 12. *Idea jacta*, n. sp., p. 526.  
 13. *Tephрина arenaria*, n. sp., p. 527.  
 14. *Fidonia albofascia*, n. sp., p. 527.  
 15. *Erosia hyperbolica*, n. sp., p. 528.  
 16. *Crambus zonellus*, n. sp., p. 528.

3. On a Case of Cross-breeding between two Species of Fly-catchers of the genus *Rhipidura*. By THOMAS H. POTTS, of Ohinitaki, New Zealand.

[Received October 27, 1884.]

The writer has repeatedly drawn attention to the interesting fact of the occasional crossing between *Rhipidura flabellifera* and *R. fuliginosa* (see Trans. N. Z. Inst. vols. ii., iii., v., & vi.; also N. Z. Journal of Science, July 1884). It is noticeable that this fact is not alluded to in the 'Manual of the Birds of New Zealand,' published in 1882, by authority of the Colonial Museum and Geological Survey Department.

In order to bring this peculiar habit more prominently before ornithologists, I forward a nest and eggs for the inspection of members of the Zoological Society of London.

I found the nest on Sept. 10, and took it this morning; it contained three eggs. Before I removed it, I saw both parent birds undertake the duties of incubation in turn, relieving each other at brief intervals. The cock bird was *R. fuliginosa*, with the aural plumes very small but quite distinct; the hen, *R. flabellifera*, occupied the nest till gently pushed off with the finger.

In Trans. N. Z. Institute, vol. iii. p. 80, will be found some account of the nests of *Rhipidura*, specimens of which were taken both on Banks' Peninsula and in the Malvern district to the west.

Ohinitaki, September 12, 1884.

---

November 18, 1884.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during October 1884:—

The total number of registered additions to the Society's Menagerie during the month of October was 108, of which 47 were by presentation, 17 by purchase, 10 by birth, 7 received in exchange, and 27 received on deposit. The total number of departures during the same period, by death and removals, was 132.

Amongst them special attention was called to a Black-necked Coly (*Colius nigricollis*), purchased October 20th, being the first example of this species received alive by the Society. (See Plate XLV. fig. 1.)

The following extracts were read from a letter addressed to the Secretary by Mr. J. G. F. Riedel, C.M.Z.S.:—

"I beg leave to say a few words on Mr. Forbes's recent observations (*suprà*, p. 425) concerning the birds collected on Timorlao by my hunters, and described by Dr. A. B. Meyer, as also concerning some of Mr. Forbes's remarks on the island-group itself.

"Before the arrival of Mr. Forbes in the Moluccas I had forwarded

birds from Timorlao and Tanembar to Europe, as I also did after his departure. I cannot understand why he should wish (p. 426) to discredit my hunters, who can all read and write; they had in former years accompanied many naturalists, such as Hoedt, Beccari, and others, and are thoroughly trustworthy. My hunters were collecting on the Tanembar and Timorlao islands for three years following, viz. on Motu, Larat, Lutur, Leera, and on the large island of Yamdena near Botani, Atemar, Wermatan, and on Selaru near Adau, therefore on many more places than Mr. Forbes's hunters. On Larat and Lutur Mr. Forbes did not penetrate into the country, as his hunters themselves and the Dutch official on Ritabel (a half-caste) assured me, being afraid of the people of Keliobar and being besides ill with fever in consequence of being insufficiently provided with the necessary food. The European superintendence of my hunters, which Mr. Forbes thinks necessary, is quite superfluous with men of their experience. My hunters also collected on Keei, Aru, and other places, and always attached labels to the birds with the habitat and the sex. Therefore no birds from other islands came into the collection from Timorlao and Tanembar, as Mr. Forbes conjectures may have been the case.

"Mr. Forbes further asserts, that the group of islands under consideration is only one, but bears two different names (p. 426), whereas in fact the natives use these two names for different parts of the group, and look on each part as a group for itself. To the Tanembar group belong:—Motu, Nuskalboor, Nusnitu, Wajanga, Maru, Kiabelenga, Nuslima, Virinun, Watborat, Nuskabawa, Nusfarata, Barnusa, Vordata, Watsira, Nukahao, Larat, Lutur, Nusanlao, Slear, Mitak, Kokolat, Wawoan, Teen, Nemaan, Nustemar, Laibobar, Taval, Wulmali or Bulumali, Tual, Unggar, Myanatraa, Nuswotar, Nujanatroot, Wuliaru, Nustaran, Wolas, Kesiwu, Seelu-Nusnitu, Salal, Sekeleer, Manu, Seera, Molin, Watuwawan, Nuskee, Lokihinilavon, Kanitwaan, Watsalat, Tendula, Kotkola, and Watletan. The islands which belong to the Timorlao group are Yamdena or Yanatleer, Anggarmasa, Vual or Tual, Erikmiri, Watleran, Nustawon or Nustabun, Watkusa, Najanat, Watdua, Nuskesa, Watsira, Solat, Selaru, and Ariama.

"The name Timorlao signifies the far east, from lao=far and timor=east, as Nusalao the far island, Seranglao the far Serang. It is erroneous to suppose that Timorlao is a corruption of the word for "seaward Timor" (p. 429), for lao is not =lawut (of the Malay). Mr. Forbes therefore is quite wrong in altering Dr. A. B. Meyer's specific name "*timorlaensis*" into "*timorlautensis*;" and as to the euphony of a word, it is difficult to dispute between different tongues, especially if the Latin is pronounced after the English fashion."

Utrecht, Nov. 1st, 1884.

---

The following papers were read:—

1. An Account of a Visit to the Birds'-nest Caves of British North Borneo. By H. PRYER, C.M.Z.S., &c.<sup>1</sup>

[Received October 16, 1884.]

In March last I visited the island of Borneo, and during my stay at Elopura determined to ascertain if possible the substance from which the Swift makes the edible nest, so much prized by the Chinese.

<sup>1</sup> In illustration of this paper Mr. Pryer sent specimens of the Swift referred to, and of its nest and eggs, also of the alga on which the bird was supposed to feed, and of the Bat which inhabits the same cave.

The Secretary stated that the Swift had been determined by Mr. Sharpe to be *Collocalia fuciphaga*, and the Bat by Mr. Dobson to be *Nyctinomus plicatus*.

The Secretary also read the following letter and Report addressed to him upon this subject:—

British Museum (Natural History),  
Crownwell Road, South Kensington, S.W.  
29th October, 1884.

DEAR SIR,

The alga contained in the bottle you left with me is a species, probably new, of *Glaucapsa*. The individuals are of microscopic dimensions, and may be found in great numbers composing the dark-coloured layers on the surface exposed to the air; the lighter-coloured, somewhat gelatinous mass consists of the dead cells of the *Glaucapsa* gradually accumulated beneath the upper layers. It is only under the influence of reagents that the remains of structure are displayed in this mass and its true nature discovered.

Species of this genus are common on damp rocks and walls of caves, but I have never seen any occurring in such masses as this one. I may mention, however, as a remarkable coincidence that I have seen an allied species of *Glaucapsa* covering with a thick coating the walls (high above high-water mark) of a sea-cave a few miles to the north of Arbroath. This cave was inhabited by numerous pigeons, and I was in the habit of frequently climbing into it when a boy for the purpose of capturing the young pigeons in their nests in the roof. The *Glaucapsa* (as I subsequently determined it) impeded me in this operation, and to the best of my recollection it grew very abundantly on the old excrement of the birds. Whether the excrement formed a specially suitable *nidus* for the alga it would be interesting to discover in regard to the present case—in which at all events the alga seems to assist in forming a *nidus* for the bird! I have examined a portion of a nest sent me by Mr. Holmes, of the Pharmaceutical Society's Museum, without finding any trace of the alga in it.

I have retained a small portion of the alga for the purpose of further determination, and I hope to have the means of comparing it with the one I refer to above.

Yours &c.,

GEORGE MURRAY.

*Report on the Edible Birds'-nest.* By J. R. GREEN, B.A., Assistant Demonstrator in the Physiological Laboratory, Cambridge.

The specimen gave no evidence under the microscope of any distinct vegetable structures, and similarly gave no chemical evidence of either cellulose or any other distinctly vegetable product. All the reactions went to prove that the great mass of the substance was *mucin*, and such microscopic features as were apparent confirmed the view that the nest was formed of strings of mucus plastered together. The mucus when separated out gave some reactions, different to a certain extent

For this purpose I spent two days in the caves of Gomanton, a high limestone cliff, situate twelve miles inland from the head of Sandakan Bay; and having been successful, I send herewith specimens of the bird, its nest, and eggs, and of the fungus said to be used in the construction of the nest.

Before starting for the caves, I inquired what it was generally thought the nests were made from, and was told that it was probably a gum or resin from some of the forest-trees, and that the statement, so often repeated in popular works on natural history, that the birds gather a seaweed for the purpose, was extremely improbable—the caves producing the largest quantity of nests being generally situated a considerable distance inland: besides that round Sandakan Bay there is a marked absence of seaweed, which does not grow in any quantity at the various points which I touched at.

On the 19th of March, at half-past 10 o'clock A.M., together with a gentleman in the employ of the British North-Borneo Company, I left the flourishing little town of Elopura, at the entrance of Sandakan Bay, for the Sapugaya River, which flows into this Bay about 8 miles below the town. Our party was composed of two Englishmen (W. and self), one Chinese cook, five Malays, eight Sulus, a Buludupi, and my Japanese collector, eighteen in all, representing six different languages, the conversation between these different specimens of *Homo sapiens* being carried on in Malay. Our mode of conveyance was a steam-launch, having in tow a large boat to which we were to transfer ourselves when the river grew too shallow to proceed further in the launch. We reached the mouth of the Sapugaya at noon. Flying about the Bay were a number of Frigate Birds and a few birds of prey. The river presented the usual features of all North-Bornean scenery: the land at the mouth and for several miles each side was covered with a Mangrove swamp; further up the Nipas replace the Mangroves, until, where the river-banks rise above the reach of the tide, the true forest extends down to the water's edge. Curlews, Kingfishers, and Sandpipers flew along ahead of us.

Making the launch fast to the landing-stage of a coffee and sugar plantation, we took to our rowing-boat, as beyond the plantation further navigation in the steam-launch is unsafe; after rowing for some hours our sleeping-place for the night was reached. This was a very primitive affair, being a long narrow shed thatched with altaps made from the Nipa leaf, and raised some six feet from the ground on posts, the floor being composed of unbarked sticks ten feet long; over this we spread a large india-rubber (without which no one should travel), and made ourselves as comfortable as possible under the circumstances. I had brought my mosquito-net, but did

from those which are given by ordinary mucin; but these differences were not great enough to weaken the conclusion that the nest is really composed of mucus secreted by the peculiar glands, superficially described by Sir Everard Home, as present in the bird which builds the nest. It would be very interesting to obtain these birds in living condition, so that one might study the mechanism of the secretion of such a relatively enormous mass of material as well as examine the constituents of the secretion taken quite fresh.

not require it, as there are, very fortunately, no mosquitoes, and I was not annoyed with them at any time during my stay in Borneo.

Next morning at 7 o'clock A.M. I started for a five hours' walk through the forest: the track is a good one and fairly level: it follows a small stream, now dried up into a succession of small pools, swarming with small fish which are very tame, and would come up and nibble at one's fingers directly the hand was placed in the water. We were now passing out of the sandstone district, which is the formation about Elopura, rising there into high bluffs, under and upon the side of one of which the town is built. Occasional blocks of limestone showed themselves in the pools, and I began to find land-shells in abundance for the first time. Tracks of Elephants were common and very fresh, our approach having evidently just driven them off the path; an orang-utan, deer, monkeys, fire-back pheasants, crows, hornbills, &c., were seen, and the argus pheasants were calling in every direction. The forest was free from undergrowth, and one could walk in any direction unimpeded. The largest trees reach an enormous height, sending out their first branches two hundred feet from the ground, the trunks being supported by huge buttresses at the base of the trees.

At noon the path came abruptly to the foot of a high limestone cliff, which had hitherto been concealed by the forest-growth. This cliff is honeycombed with caves, most of which are connected in some way with a large one, known to the Malays by the name of Simud Itam, i.e. the Black Cavern. The entrance to this is at the foot of the cliff and is about 100 feet wide and 250 feet high; inside the height is greater, the roof being 360 feet from the ground; it is well lighted, as about 200 yards from the entrance there are two large circular openings in the roof. Here a number of the Swifts were flying about, and also numbers of Bats, the ground being covered with large quantities of guano. The birds'-nests could be seen attached to the sides and roof. From various corners and places, apparently inaccessible, could be seen the rattan ladders and stages used by the nest-gatherers. I have seen many caves in other parts of the world, but nothing to compare with this one, which strongly reminded me of a huge cathedral, but far surpasses in its grandeur any work of human hands.

From the mouth of the cave ran a small amount of water, strongly impregnated with guano, and on this many butterflies of the genera *Papilio* and *Pieris* settled; a very pretty *Cyrestis* was flying in and out: I secured several specimens, but missed a most lovely *Papilio*, quite new to me and which I believe to be undescribed. Tracks of Pigs led in all directions about the floor of the cave.

After a rest I ascended the cliff about 400 feet; the ascent is quite perpendicular: in many places ladders are erected and in others the water-worn surface of the limestone gives a foothold. On the ascent I noticed many Orchids, Begonias, ferns, and mosses I had not seen elsewhere. My collector caught a snake I believe to be an *Elaphis*, certainly the most beautiful Colubrine I have seen, white and light grey. The Malays said it was very destructive to the Swifts,

and also that it was poisonous; to convince them it was not, I allowed it to bite me. At this point I found myself at the mouth of a cave named Simud Putih, *i. e.* the White Cave; the entrance is about 40 feet high by 60 feet wide, and descends very steeply, widening out to a great size, and having a perpendicular unexplored abyss at its furthest point. This cave is used by the nest-gatherers as their dwelling-place, and at the entrance are their platforms of sticks, one of which was placed at my disposal by the head man: it is also the cave by which the great body of the Swifts enter. Immediately outside it is a great circular opening leading sheer down into Simud Itam: this is one of the two openings mentioned as giving light to that cave, and is the entrance most in use by the Bats. As soon as I had unpacked and settled down on my platform, I sallied out to find the material from which the birds make their nests, as my previous experience is that birds do not as a rule travel far for the bulk of the material they use. I was speedily successful in my search. It is a fungoid growth which incrusts the rock in damp places, and when fresh resembles half-melted gum tragacanth: outside it is brown but inside white, and little if any change in its consistency is effected by the bird; the inside of the nest is, however, formed by threads of the same substance, which are drawn out of the mouth in a similar way to that of a caterpillar weaving its cocoon.

The Malays told me to be sure and return to Simud Putih at 5 o'clock, as I should then see the most wonderful sight in all Borneo—the departure of the Bats and the return to roost of the Swifts. I accordingly took a seat on a block of limestone at the mouth of the cave; the surface of the coral of which it is composed is quite fresh looking, notwithstanding that it must have been many ages in its present position, several hundred feet above sea-level. Soon I heard a rushing sound, and, peering over the edge of the circular opening leading into Simud Itam, I saw columns of Bats wheeling round the sides in regular order. Shortly after 5 o'clock, although the sun had not yet set, the columns began to rise above the edge, still in a circular flight: they then rose, wheeling round a high tree growing on the opposite side, and every few minutes a large flight would break off and, after rising high in the air, disappear in the distance; each flight contained many thousands. I counted nineteen flocks go off in this way, and they continued to go off in a continual stream until it was too dark for me to see them any longer. Among them were three albinos, called by the Malays the Rajah, his son, and wife.

At a quarter to 6 the Swifts began to come in to Simud Putih: a few had been flying in and out all day long, but now they began to pour in, at first in tens and then in hundreds, until the sound of their wings was like a strong gale of wind whistling through the rigging of a ship. They continued flying in until after midnight, as I could still see them flashing by over my head when I went to sleep. As long as it remained light I found it impossible to catch any with my butterfly-net; but after dark it was only necessary to wave the net in the air to secure as many as I wanted. Nevertheless

they must undoubtedly possess wonderful powers of sight to fly about in the dark in the deepest recesses of their caves and to return to their nests, often built in places where no light ever penetrates.

Shortly before sundown a pair of Kites made their appearance, and, taking their station over the Bat-chasm, would every now and then clumsily swoop down into the thick of the Bats, generally securing a victim every time. I shot both these marauders, which proved to be *Haliaster indus*, a very beautiful but common bird. There were also several specimens of a Hawk working away on the Bats in a very business-like manner, and woe betide the unfortunate bat singled out from its flock and put in chase. The way these Hawks took the Bats one after the other was astonishing, and strongly reminded me of a man eating oysters. I shot several of these Hawks, but only secured one, the others being lost over the side of the cliff. It proved to be the rare *Machirhamphus alcinus*, remarkable for the size of its gape and its small beak, both of which very much resemble those of the Swift. Its habits in taking its prey are also similar, the Swift catching and swallowing its food while on the wing in the same way this Hawk does.

Arising before daylight, I witnessed a reversal of the proceedings of the previous night, the Swifts now going out of Simud Putih and the Bats going into Simud Itam. The latter literally "rained" into their chasm for two hours after daylight. On looking up, the air seemed filled with small specks, which flashed down perpendicularly with great rapidity and disappeared in the darkness below.

Several examples of *Machirhamphus alcinus* put in an appearance, hawking after the Swifts, which they had rarely attempted to take the night before, and generally then without success. Their plan now was to swoop down from behind into the stream of birds issuing from the mouth of Simud Putih, generally carrying off a bird each three times they attempted to do so.

I secured many specimens of the Bat, and found them to be all of one species; the caudal membrane extends only half down the tail, which is free for half an inch, giving the animal very much the appearance of a mouse when the wings are folded. The wings are very long and narrow, and it is a very swift flyer. I noticed a few specimens of a Swallow resembling *Hirundo rustica*, and also some very large Bats at the mouth of the cave.

After breakfast I started for the summit of the cliff; the path, which is barely two feet wide, in many places overhangs the Bat-chasm, the bottom of which is lost in darkness 600 feet below. The summit at 900 feet is reached: here was a most lovely view:—to the east is a large plain, in the early morning covered with mist resembling a vast sheet of water; this is no doubt the origin of the mythical lake of Kina Balu, which only exists in the imagination of the map-makers. In every direction except the north extended miles upon miles of forest, broken here and there by mountain-tops. Unfortunately Kina Balu, the highest mountain in Malayasia, was hidden by clouds. To the north I could trace the whole of Sandakan Bay and the open sea beyond. I was much surprised to find

how short a distance in a direct line, only some 20 miles, I had actually come from Elopura : it had taken some  $13\frac{1}{2}$  hours' continuous travelling by launch, boat, and walking to reach this point. On the highest part the Malays have built a house, into which I was invited, and inspected a quantity of very fine white nests, gathered from a small opening close by, which is however 116 fathoms deep, and is connected, as I afterwards found, with Simud Putih.

I then commenced to descend by another track, and found it much easier work than going up. About 200 feet below the summit a large opening is reached ; this looks exactly like a railway-tunnel. Lighting candles and attaching them to the lower part of the staves each of the party carried, the gloomy portal was entered, and daylight was soon lost sight of, the path becoming steeper and more slippery the further it descended. About 500 feet below the entrance it became unpleasantly warm and the atmosphere stifling, the guano giving out a most disagreeable smell. I was here shown a small beam of light from the small opening at the top of the rock, 696 feet above. The footing became here very precarious, single poles being laid on the surface of the soft guano, upon which I found considerable difficulty in balancing myself. The guano exists in enormous quantities in this cave ; a fifteen-foot pole, thrust down into it, does not touch the bottom. Just when matters were getting unbearable the cave turns to the right, and the path commences to ascend, and I was very glad to find Simud Putih had been reached : after a slippery climb I merged into daylight, very much dazzled. All the roof of the dark parts of the cave was occupied by the nests of the Swifts, the birds keeping up an intermittent twittering, sounding, from the immense quantity assembled, like surf breaking on a rocky shore.

In this cave I saw the nest-gatherers at work getting in their crop. A thin rattan ladder was fixed to the end of a long pole and wedged against the rock ; two men were on the ladder—one carried a long four-pronged spear, a lighted candle being fixed to it a few inches below the prongs. By the aid of this light a suitable nest is found and transfixed with the prongs ; a slight twist detaches the nest unbroken from the rock ; the spear is then withdrawn until the head is within reach of the second man, who takes the nest off the prongs and places it in a pouch carried at the waist. The nests of best quality are bound up into packets with strips of rattan, the inferior being simply threaded together ; the best packets generally weigh one catty ( $1\frac{1}{3}$  lb.), averaging forty nests, and are sold at \$9 each—the annual value of the nests gathered being about \$25,000. These caves have been worked for seven generations without any diminution in the quantity : three crops are taken during the year, and unless a considerable number of black nests is gathered, the supply of white nests falls off. Accidents to the men employed very rarely occur, notwithstanding the dangerous nature of their occupation. There is also an almost inexhaustible supply of guano in these caves ; and the number of bats and birds in them is so enormous that if proper care is taken not to disturb them, a regular quantity may be taken out yearly without fear of exhausting the supply. These caves are

therefore a very valuable property to the British North-Borneo Company.

On the 22nd March, at 7 A.M., I left Simud Putih, and after a farewell visit to Simud Itam commenced the return journey. The Sapugaya River was reached before noon, but I was disappointed at finding our boat high and dry, the tide being out. As it had not returned at half-past 4 o'clock all hands were mustered to carry the boat down bodily to deep water; this was soon accomplished, although the boat was a very heavy one. Just at dusk we rowed up to the steam-launch; several of that very peculiar animal the Galeopithecus were floating from tree to tree on the plantation, and I noticed some very large Bats flying about. Getting up steam, we then proceeded very cautiously along between the high Nipas which lined the banks and rendered steering in the dark a difficult matter. At half-past 10 P.M. the pier at Elopura was reached.

## 2. On some Mammals from Somali-land.

By P. L. SCLATER, M.A., Ph.D., F.R.S.,

Secretary to the Society.

[Received November 12, 1884.]

(Plates XLIX. & L.)

Mr. C. Hagenbeck of Hamburg, the well-known dealer in living animals, has kindly sent to me some flat skins of Mammals, prepared by the natives of Somali-land, which he received along with a collection of living animals recently imported from Berberah.

As little is yet known of the Mammals of this interesting country, I have thought it worth while to lay these skins before the Meeting, and to offer a few remarks upon some of them which present points worthy of notice.

Our present authorities upon the Mammals of Somali-land are but few in number. Mr. Blyth's report on Captain Speke's collection<sup>1</sup>, Heuglin's essay on the Fauna of the Red Sea and Somali-coast<sup>2</sup>, and Révoil's 'Faune et Flore des Pays-Somalis,'<sup>3</sup> are the only ones that I can mention concerning the north of Somali-land; but Von der Decken's expedition penetrated into the south of the same country, and the reports on his collections should also be consulted.

In Captain Speke's list but three species of Antelopes are mentioned, one of which, called by Mr. Blyth *Gazella cuvieri* and subsequently *Gazella spekii*, may probably be the same as that of which a skin is now before you. In the zoological volume on the

<sup>1</sup> "Report on a Zoological Collection from the Somali Country," by E. Blyth: Journ. Asiatic Soc. Bengal, vol. xxiv. p. 291 (Svo, Calcutta, 1856).

"Report on a Zoological Collection from the Somali Country," by Edward Blyth. Reprinted from the 24th vol. of the Journ. Asiatic Soc. Bengal; with Additions and Corrections by the Collector, John Hanning Speke (Svo, London, 1860).

<sup>2</sup> 'Petermann's Mittheilungen,' 1861, p. 11.

<sup>3</sup> Révoil, 'Faune et Flore des Pays-Somalis' (Svo, Paris, 1882).



J. Smith.

GAZELLA WALLERI.

Hanhart imp.





J. Smal. lith.

Harbent imp

1. WILD ASS OF SOMALILAND.



results of Révoil's explorations no Antelope is mentioned among the Mammals; but in the volume on his travels<sup>1</sup> (p. 369) the native and French names are given of three species of this group.

The skins which I now exhibit belong apparently to five species:—

1. *STREPSICEROS IMBERBIS*, Blyth.

Of the Lesser Koodoo I have only recently given a figure and description in the Society's 'Proceedings' (P. Z. S. 1884, p. 45, pl. iv.). In the collection now before us are two skins of this species not materially differing from one another or from the description above referred to.

2. *BOSELAPHUS CAAMA* (Cuv.).

A single flat skin in the collection is certainly that of a species of *Boselaphus*, and probably of *B. caama*, as Von der Decken is stated to have found that species on Lake Jipé in Southern Somali-land<sup>2</sup>.

3. *GAZELLA WALLERI*. (Plate XLIX.)

*Gazella walleri*, Brooke, P. Z. S. 1878, p. 929, t. lvi.

The two skins which I now exhibit (see Plate XLIX. fig. 1) probably belong to the same Antelope. They are at once recognizable by the very wide and well-marked dark-brown dorsal line, which in its widest part measures across the back from seven to eight inches, and stands out in strong contrast to the lighter rufous of the sides. The whole length of the skins, from the crown of the head to the base of the tail, is about 4 ft. 6 in.; the belly and undersides of the limbs are white. One of the skins is probably that of an older animal than the other, being rather larger and darker in colouring.

From such imperfect specimens, although one may say that they are those of some unknown Antelope, it would not be possible to determine much. But fortunately I have been favoured by Mr. F. L. James, of 14 Great Stanhope Street, with the loan of the perfect head of an Antelope (see Plate XLIX. fig. 2) shot near Berberah in March last, which evidently belongs to the same species. It will be at once seen on comparison that the texture and colour of the hair on the nape of the neck agree perfectly with those of one of the flat skins, so nearly, indeed, that one might have supposed that the head and flat skin may have belonged to the same individual.

I was about to describe this Antelope as new when my attention was called to the figure and description of the skull and horns of an Antelope given by Sir Victor Brooke in the Society's 'Proceedings' for 1878, upon which his *Gazella walleri* is based, as probably belonging to the same species. In order to endeavour to set this question at rest I have borrowed from the Rev. H. Waller one of the specimens upon which *Gazella walleri* was based. As will be seen by comparison of the skull and horns thus kindly loaned to me with the mounted head belonging to Mr. James, the general

<sup>1</sup> 'La Vallée du Darfour. Voyage aux Pays-Somalis.' Par G. Révoil. Paris, 1882.

Cf. Peters in Von der Decken's 'Reisen,' Bd. iii. Abth. 1. p. 9.

form of the horns is much the same in both specimens. The chief differences are in the slightly greater size and greater length of the horns in Mr. James's specimen, and especially in the more decided twist forward at their anterior extremities. On the whole, however, I think it better to conclude that they belong to the same species until the contrary is shown.

The external form of *Gazella walleri* (assuming this view to be correct) may be shortly described as follows:—Horns lyrate, strongly ringed, running backward almost in a line with the face, and bent forward at the tips. Length, following the curve along the upper surface, 14 inches; in a straight line from base to tip, 11 inches; distance between the point at the tips 3 inches; extreme width  $7\frac{1}{2}$  inches; circumference of horn near the base 5 inches.

*Colour.* Nose, front of face, top of head, neck above and on each side, and brown dorsal band (6 to 7 inches in width) extending all down the back dark brown, almost chestnut. Flanks, separated by a well-marked margin from the dorsal colour, pale brown; sides of face round the eyes, chin, and line below the throat, and body beneath white. Length of skin, from nape to the base of the tail, about 48 inches.

*Hab.* Somali-land, vicinity of Berberah.

I may remark that of two pairs of horns in the British Museum received from Sir John Kirk and determined as *Gazella walleri*, one pair nearly resemble the typical specimen and the other Mr. James's head.

4. *GAZELLA SPEKII*, Blyth, Cat. Mamm. Mus. As. Soc. p. 172 (1863).

The skin of a small species, probably the same as that to which Mr. Blyth gave this name from Speke's specimens obtained at Berberah<sup>1</sup>.

5. *EQUUS ASINUS SOMALICUS*, sp. (aut subsp.) nov. (Plate L. fig. 1.)

Of the Wild Ass of Somali-land Mr. Hagenbeck has not only furnished us with the flat skin which I now exhibit, but has also sent us on deposit a fine living male specimen, which was received on the 11th of August last, and is now in excellent condition.

We have also, fortunately, living in the Gardens a specimen of another African Wild Ass, from the Nubian Desert, purchased in May 1881; so that it is easy to institute a comparison between the two, and to assure ourselves that they belong apparently to distinct species or subspecies.

As will be seen by Mr. Smit's drawings which I now exhibit, the Somali Ass (Pl. L. fig. 1) differs from that of the Nubian Desert (Pl. L. fig. 2) in its generally paler and more greyish colour, in the entire absence of the cross-stripe over the shoulders, in the very slight indication of the dorsal line, and in the numerous black mark-

<sup>1</sup> Cf. Blandford, Geol. & Zool. Abyss. p. 361.

ings on both front and hind legs. It has likewise, as will be better noticed on examining the living animals, smaller ears and a longer and more flowing mane.

It might be supposed that these are individual variations. But, as will be seen upon inspection of the flat skin from Somali-land which I now exhibit, the same distinguishing features likewise present themselves in this second specimen. Moreover, Mr. E. Lort Phillips, F.Z.S., who visited the Berberah district in March last in company with Mr. F. L. James and his brother, assured me that the Wild Asses which he there met with were exactly of the same description.

Mr. Lort Phillips writes as follows:—

“On March 22, 1884, when about 20 miles to the west of Berberah we fell in with a small herd of Wild Asses. After a long and tedious stalk I succeeded in bagging one; which turned out to be of quite a new species to me, having no mark whatever on the body, which was of a beautiful “French grey” colour. On its legs, however, it had black stripes running diagonally. I have unfortunately lost the book in which I put its measurements, but it was a superb creature and stood quite 14 hands at the shoulder; our Berberah horses looked quite small in comparison. The previous day Mr. F. L. James had shot a new Antelope<sup>1</sup>, and Mr. W. D. James a Lesser Koodoo.”

It would likewise, I think, be probable on theoretical grounds that animals occupying such different and widely separated areas of distribution would present points of difference.

But assuming this to be the case, a great difficulty arises as to the proper terms to be applied to these two animals. I have hitherto called the Nubian form of which we have had a specimen in the Gardens before the one that is now living there<sup>2</sup> *Equus tæniopus*, Heuglin. In so doing I acted on the supposition that only one species of African Wild Ass was known to exist. But seeing there appear to be two, it becomes necessary to make some further inquiries on the subject.

Heuglin described his *Equus tæniopus* in his article on the Fauna of the Red Sea and Somali Coast already referred to. In his appendix to this article (Petermann's Mittheilungen, 1861, p. 19) he distinguishes two species of African Wild Ass. The first of these, from the provinces of Taka and Berber, is clearly our animal of the Nubian Desert, which he proposes to call *Equus asinus*. The second species, which he attributes to Shoa and the Somali Coast, he proposes to call *Equus tæniopus*. But when we come to read his description of *Equus tæniopus*, and to examine the figure of the same animal contained in the 28th volume of the ‘Nova Acta’ of the Leopoldino-Carolinian Academy, we find that the animal designated by this name is clearly not that of the Somali Coast, as it possesses a well-marked dorsal stripe and a strongly defined cross-line over the shoulders. Moreover, Heuglin himself tells us that the specimen from which the description of *A. tæniopus* was taken was a

<sup>1</sup> I.e. the specimen of *Gazella walleri* above referred to.

<sup>2</sup> See Catalogue of Animals, 1883, p. 130; and P.Z.S. 1881, p. 734.

living animal of which he did not certainly know the locality. Under these circumstances we cannot apply the term *tæniopus* to the Somali form of Wild Ass. Nor can we apply it to the Nubian form, which Heuglin himself termed *Equus asinus*. To the latter animal, however, Fitzinger in 1866 (Sitzungsb. k. Akad. Wien, liv. p. 588) gave the specific name *africanus*, which I propose to retain for the Nubian form of Wild Ass, while the Somali form may be called *Equus asinus somalicus*.

These two forms may be diagnosed as follows:—

1. *EQUUS ASINUS AFRICANUS*. (Plate L. fig. 2.)

*Equus asinus*, Heuglin, Pet. Mitth. 1861, p. 19.

*Equus africanus*, Fitzinger, Sitz. Ak. Wien, liv. p. 588 (1866).

Minor: *isabellino-griseus*; *linea dorsali distincta et altera trans humeros nigricante*; *juba brevi erecta*; *pedibus plus minusve nigro transfasciatis*.

*Hab.* in desertis Nubiæ superioris.

2. *EQUUS ASINUS SOMALICUS*. (Plate L. fig. 1.)

Major: *griseus*; *linea dorsali fere obsoleta*, *humerorum nulla*; *juba longiore*, *caduca*; *pedibus distincte et frequenter nigro transfasciatis*.

*Hab.* in terra Somalica.

P.S.—Since this paper was read I have had the opportunity of reading Herr Menges's article on his excursion into Somali-land, contained in Petermann's 'Mittheilungen' for the present month<sup>1</sup>. Herr Menges, who was the traveller employed by Mr. Hagenbeck to collect living animals, gives us a most interesting account of two of the Antelopes above mentioned, and also alludes to the Wild Ass.

On the high plains south of Berberah he met with what was evidently *Gazella walleri*, which, he says, is one of the most beautiful Antelopes of Somali-land, and is called by the natives "Gerenuk." He compares it with *G. dama* and *G. scæmmerringi*, but says it is manifestly different in its colouring. While the body is of a coffee-brown, it has a broad darker band on its back 10 to 15 centimetres in width. The neck is remarkably long. The horns are short and rather strong, curved gracefully backwards, but projecting forwards at the tips.

In the mountains further south Herr Menges found the Dwarf Koodoo (*Strepsiceros imberbis*) more abundant than the larger species (*S. kudu*), and calls it the "most beautiful of all Antelopes known to him." It is termed "Aderio" by the Somalis, and is distinguishable from the larger Koodoo, as he says, not only by its smaller size (which is about that of a Fallow Deer) but by the more numerous cross-stripes, of which there are from twelve to fifteen across the back, while the larger Koodoo has only four or five.

The Wild Ass Herr Menges merely mentions as being different in colour from other species known to him.

<sup>1</sup> Ausflug in das Somali-land. Von Josef Menges. Peterm. Mittheil. 1884, p. 401.

3. A Contribution to the Anatomy of *Scopus umbretta*.

By F. E. BEDDARD, M.A., F.Z.S., Prosector to the Society.

[Received November 5, 1884.]

The dissection of two specimens of *Scopus umbretta* has enabled me to bring a few notes upon its anatomy before the Society. One of these individuals lived in the Society's Gardens from 1880 to 1884, the other was sent to the late Mr. W. A. Forbes from Africa. Both were partially dissected by Mr. Forbes; and in preparing the following account I have had the advantage of consulting a few MS. notes left by him.

As but little is known about the structure of *Scopus*, its exact systematic position is still a matter of doubt; the facts that are known (and these are confined to the pterylosis and structure of the skeleton) appear to be on the whole in favour of placing *Scopus* among the Ciconiidae, as has been done by Mr. Slater in the most recent edition of the 'List of Animals.'

The arrangement of the feather-tracts in *Scopus* is described in some detail by Nitzsch, who has pointed out that the powder-down patches distinctive of the true Herons are absent from *Scopus*<sup>1</sup>; in this and in other pterylographical characters *Scopus* comes nearer to the Storks than to the Herons.

Our knowledge of the osteology of *Scopus* is at present entirely due to Prof. Parker, who has described its shoulder-girdle in his 'Monograph on the Shoulder-girdle and Sternum'. Some scattered remarks on the osteology of *Scopus* and the affinities which they indicate are also to be found in a memoir by the same writer on *Balaeniceps rex*<sup>2</sup>. Prof. Parker is of opinion that *Scopus* is truly Ciconiine, and is connected with the true Herons by way of *Balaeniceps* and *Cancroma*, the latter type being essentially Heron-like, while *Balaeniceps* has "the Heron characters in preponderance."

It view of these facts, it is rather remarkable to find that Dr. Hartlaub, in his work on the Birds of Madagascar, definitely includes *Scopus* as a genus of the family Ardeidae, separating it therefore entirely from the Storks; nevertheless it appears to me that there is in reality quite as much to be said in favour of the Ardeine as of the Ciconiine affinities of the bird, from a study, that is to say, of the muscles and viscera.

With regard to the latter, the only published notes (so far as I am aware) are to be found in Mr. Forbes's Report on the Tubinares collected by H.M.S. 'Challenger'; in that memoir Mr. Forbes has described the partly double condition of the pectoral muscle in *Scopus*, which I have referred to below.

Two plates illustrating the osteology of *Scopus* are to be found in the last published part of the magnificent 'Histoire Naturelle

<sup>1</sup> Pterylography (English Edition). Ed. Slater: London, 1867, p. 130.

<sup>2</sup> Ray Soc. Publications (London, 1869), p. 165.

<sup>3</sup> Trans. Zool. Soc. vol. iv. p. 347 *et passim*. See also Trans. Zool. Soc. vol. v. p. 234.

de Madagascar,' but the letterpress has not yet appeared; M. Milne-Edwards no doubt intends to describe the osteology, and for that reason I have not entered into any description of it in the present paper.

*External Characters.*—Nitzsch does not refer to the condition of the oil-gland in his account of the pterylosis of *Scopus*, merely remarking its presence. In the two specimens before me the oil-gland is distinctly tufted, and has three orifices at its free end. I may also mention that there are 12 rectrices, and that the contour-feathers are furnished with an aftershaft.

*Visceral Anatomy.*—The tongue is comparatively small and triangular, agreeing in this respect with *Cancroma* and *Baleniceps* alone among the Ardeidæ; the other genera of the family possess a long slender tongue, extending nearly as far as the mandibular symphysis; the tongue in the Ciconiidae is much as in *Scopus*.

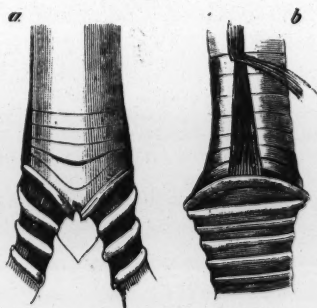
There is no crop; of the liver the right lobe is larger than the left; there is a conspicuous gall-bladder present, its duct opening on to the ascending loop of the duodenum.

There are two carotids with the normal course running up the neck side by side in the hypapophysial canal.

Both jugulars are present, the right larger than the left.

The syrinx is displayed in the two accompanying drawings

Fig. 1.



Syrinx of *Scopus umbretta*.

*a*, from before; *b*, from the side.

(figs. *a*, *b*). There are a pair of intrinsic muscles inserted on to the second bronchial ring (fig. 1), fanned out at their attachment; the first bronchial rings are ossified, and closely applied to the preceding rings of the trachea; the rings of the bronchi are incomplete internally and united by membrane; there is a well-developed bony pessulus, a prolongation of the last tracheal ring. The *bronchidesmus*, as Prof. Garrod has termed the fibrous membrane uniting the two bronchi, is incomplete, not extending as far forward as the point where the two bronchi bifurcate. The syrinx of *Scopus* is therefore not at all Stork-

like, and presents no important differences from that of the Herons and Bitterns. In the Storks (*cf.* Weldon, P. Z. S. 1883, p. 639) there are no intrinsic muscles; the bronchial rings are generally complete internally; the last tracheal and first bronchial rings are ossified and firmly united, while above them are a number of tracheal rings which are slender and delicate and often incomplete; the *bronchidesmus* (at any rate in *Tantalus* and *Leptoptilus argala*) is continuous up to the bifurcation of the bronchi.

The peculiar structure of the air-sacs described by Weldon in the Stork is not to be found in *Scopus*; the subbronchial sacs are completely fused, but the præbronchials are not divided up by septa as they are in the Stork. In these characters also *Scopus* is entirely unlike the Storks, and conforms to the Ardeine type.

#### MUSCLES OF THE FORE LIMB.

1. The *latissimus dorsi* is composed, as in the majority of birds, of two distinct portions:—(1) the anterior arises from the spines of the second and third dorsal vertebræ, and is attached by a broad muscular insertion below the accessory tendon of *anconeus longus*; (2) the posterior half is the larger, but narrows rapidly towards its tendinous insertion in front of anterior half and continuous with accessory tendon of the *anconeus*.

2. The *cucullaris superficialis* is attached to the anterior half, or rather more, of the vertebral border of the scapula.

3. The *cucullaris profundus* is attached to the whole of the vertebral border of the scapula, except perhaps its extreme coracoidal end; the fibres of this muscle pass in a backward direction from the vertebræ to the scapula, while those of the *superficialis* pass in a forward direction, the two crossing each other very nearly at right angles.

4. The *serratus* arises in the ordinary fashion from ribs 2, 3, and 4, and is inserted on to the vertebral border of the scapula ventrad to the insertion of the *cucullaris* by a broad thin tendon for nearly half its length posteriorly.

5. The *deltoid* arises from the distal end of the scapula close to its articulation with the coracoid by a fleshy origin in front and by a short tendon behind; it is inserted on to the outer side of the crest of the humerus.

6. The *internal deltoid* arises from the tip of the coracoid, and is inserted on to the opposite side of the humeral crest, anterior to and somewhat below the insertion of the pectoral muscle.

7. The *pectoralis I.* arises from whole of hinder surface of sternum, from the entire extent of the carina sterni, and from the margin of the clavicle; it is inserted on to the crest of the humerus, and also to a fibrous aponeurosis which extends from the crest to the head of the humerus, covering the tendon of the biceps. The muscle itself is not actually double, but is partially divided by a tendinous septum, which is very evident on making a transverse section.

8. The *pectoralis II.* is of considerable size; its origin extends some two thirds down the sternum; it arises also from the sternal half of

the coracoid and from the coracoclavicular membrane; its insertion is not peculiar.

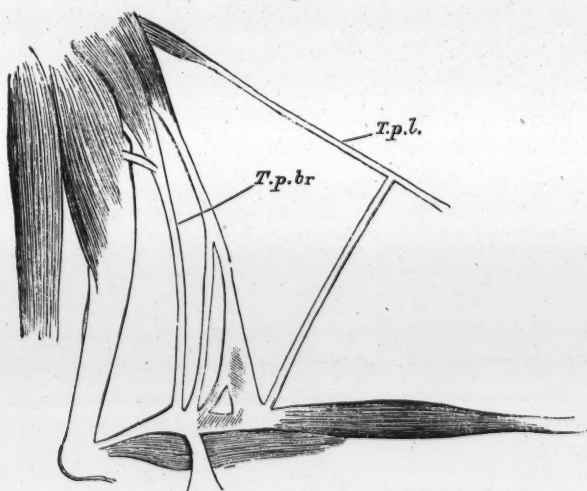
9. The *coracobrachialis externus* arises from the sternal end of the coracoid; it has the usual insertion.

10. The *coracobrachialis internus* is rather smaller; it appears to have the ordinary relations.

11. The *teres* arises from nearly the whole of the ventral margin of the scapula; just before it narrows into the tendon of insertion, it gives off a small tendinous slip which joins the *anconeus longus* close to its origin: it is inserted into the inferior caputal fossa just anterior to the origin of a portion of the *triceps*.

12. The *tensor patagii* muscle (fig. 2) is formed of the combined *brevis* and *longus*, which are not to be distinguished at their origin; it arises from the end of the clavicle and from a small portion of the scapula; the outer portion, which corresponds to the *tensor patagii*

Fig. 2.



Muscles and tendon of patagium of *Scopus umbretta*.

*T.p.l.*, Tensor patagii longus; *T.p.br.*, tensor patagii brevis.

*longus* (*T.p.l.*), receives a slip, chiefly tendinous, from the *pectoralis I.*; its tendon passes straight to the radial carpal bone, but about the middle of its course gives off a branch which joins the outer of the two tendons which form the *tensor patagii brevis*. The tendon of the *tensor patagii brevis* (*T.p.br.*) is double; at the junction of the belly of the muscle with the outer of the two tendons a small tendinous slip is given off to the crest of the humerus; the inner tendon receives a slip from the pectoral at a corresponding spot. The outer tendon

is continued without any change to the radial aponeurosis; the inner tendon about half way down gives off in front a broad, thin, flat tendon, which passes down parallel to the other half of the tendon and is inserted near to it; at this point it receives the slip from the tendon of the *tensor patagii longus* already referred to. There is no biceps slip to the patagium.

13. The *biceps* has the usual double origin, and is inserted on to the radial margin of the ulna and on to the ulnar margin of the radius.

14. The *anconeus longus* arises from the scapula close to the articulation of the humerus by a single head, the outer half of which is tendinous about half an inch from the origin; it gives off a broad flat tendon to the outer edge of the humerus; it ends below in a long stout tendon attached to the anterior border of the olecranon process of the ulna.

15. The *triceps* arises from the head of the humerus just external to the insertion of the *teres* and from a considerable proportion of the shaft; it blends with the *anconeus longus* at its insertion on to the ulna behind the latter.

The *expansor secundariorum* appears to be absent.

16. The *pronator radii superficialis* arises from the inner condyle of the humerus; it is inserted into the upper margin of the radius.

17. The *pronator radii profundus*, twice as large as the last, arises from the humerus below it; it is inserted on to the radius below the insertion of the last, and extends considerably beyond. Between the two pronators is a small muscle which arises in common with the *pronator profundus*; it is attached partly to the tendinous surface of the latter and partly by a slender tendon to the radius.

18. The *flexor carpi ulnaris* is a strong muscle arising by fleshy origin from distal extremity of humerus; it is inserted by a long thick tendon on to the ulnar carpal bone.

19. The *external anconeus* arises from the common tendon from the external condyle of humerus; it is inserted into the proximal one half of the upper part of the ulna (except at the extreme end).

20. The *extensor carpi ulnaris* arises from a long tendon from outer condyle of humerus together with the *anconeus externus*, and from the tendinous septum between it and the latter; it is inserted by a long tendon about one third of the way down the metacarpal of digit II. on the outer inferior margin.

21. The *extensores carpi radialis longus* and *brevis* arise from the outer condyle of humerus above all the other muscles of the forearm; they are in close contact for the whole of their length, and are inserted on to the tuberosity of the metacarpal of the first digit.

22. The *extensor communis digitorum* arises from the outer condyle of the humerus above and a little behind the *extensor carpi ulnaris*; it divides at the base of the thumb into two tendons, the first of which is attached to the digital margin of the phalanx of the pollex; the other is similarly attached to the second phalanx of digit II.

23. The *supinator* is a small muscle arising from outer condyle of humerus to the inside of and above the common tendon; it is attached to upper surface of radius.

24. The *internal anconeus* arises from internal condyle of humerus below all the other muscles; it spreads out in a fan-like manner to be inserted on to the ulna superficial to (below) the attachment of the *brachialis internus*.

25. The *brachialis internus* is a broad, flat muscle arising from the deep pit on the inside of the humerus; it is inserted on to the ulna close to the *internal anconeus*.

26. The *flexor digiti II. major* arises by a moderately long tendon from the inner condyle of humerus; it is connected by flat tendinous bands with the secondaries; about an inch before the wrist it divides into two tendons, one of which runs forward and is attached to the internal tendon of the wrist; the other, the main tendon of insertion, passes round the wrist, and is inserted on to a considerable portion of the inner anterior margin of the first phalanx of the index; during the latter part of its course the tendon of this muscle is crossed by that of the

27. *Flexor digiti II. minor*.—This muscle arises from the middle portion of the radial margin of the ulna, commencing just in front of the insertion of the *brachialis internus*, and extending as far forward as the origin of the *extensor internus*; its tendon passes above that of the flexor major, and is inserted on the anterior edge of the second phalanx of the index, close to its proximal end.

28. The *extensor internus manus* arises from the distal half of the ulna, commencing just after the attachment of *flexor digiti II. minor*; it is nearly twice the size of the latter; its tendon passes round to the extensor side of the wing, and is there inserted on to the anterior upper edge of the thumb metacarpal.

29. The *extensor pollicis* arises from distal half of ulnar margin of radius superficial to origin of *extensor indicis* and from posterior half of ulna and interosseous membrane; it is inserted on to the extensor margin of metacarpal below the *extensor metacarpi radii*.

30. The *extensor proprius indicis* arises from the ulnar margin of radius; its tendon passes below that of *extensor communis digitorum*, and receives a short muscular slip from the wrist; it is attached to the extensor margin of the proximal end of the second phalanx of the index.

I have not dissected out the intrinsic muscles of the hand.

#### MUSCLES OF THE HIND LIMB.

1. The *sartorius* arises only from the front end of the ilium; its insertion is on to the tibia just above the crural.

2. The *cruræus* arises from nearly the whole of the inner side of the femur; it is inserted by a short tendon on to the head of the tibia, below and to the inside of the insertion of the *sartorius*.

3. The *pectineus* is a small delicate muscle arising from the lower margin of the ilium just beneath the origin of the *glutæus*; it passes

outwards and backwards to be inserted on to the inner side of the femur just between the origin of the *cruræus* and *vastus internus*.

4. The extensor muscle of the thigh is composed of a number of fused muscles; it arises from both the inner and outer side of shaft of femur; it is inserted on to the patella and on to the fascia, covering the knee by a broad flat tendon.

5. Of the gluteal muscles, the outermost one (*glutæus I.*) is the largest. *Glutæus II.*, which partly underlies *glutæus I.*, is somewhat smaller. *Glutæus III.* is very small.

6. The *obturator externus* is large; it is covered superiorly by an aponeurosis, which extends back about half way to the posterior extremity.

7. The *obturator internus* has an oval origin; its tendon of attachment is surrounded by a muscular mass which corresponds to the *gemelli*.

8. The *tensor fasciæ* extends about half way down the thigh; it originates from the fascia covering *glutæus I.*

9. The *biceps* arises from the whole of the postacetabular ridge of the ilium; it is inserted, as usual, on to the fibula, after passing through a tendinous sling.

10. The *femoro-caudal* is a long, slender muscle, with the usual origin and insertion; the tendons at either end of the muscle are extremely fine.

The *accessory femoro-caudal* is quite absent.

11. The *semitendinosus* is well developed; it arises from the posterior end of the ilium and from the fascia in the neighbourhood; it is inserted on to the tendon of the gastrocnemius (see fig. 3) in common with the *accessory semitendinosus*.

12. The *accessory semitendinosus* is moderately large; it arises by fleshy origin from inferior margin of femur close to its distal extremity, and is inserted partly on to the oblique tendon between it and the *semitendinosus*, and partly on to the tendon which connects the latter with the gastrocnemius.

13. The *semimembranosus* is half as broad again as the *semitendinosus*; it arises from the lower margin of hinder portion of ischium and from a small portion of the pubis posteriorly; it is inserted by a thin broad tendon on to the inner side of the leg.

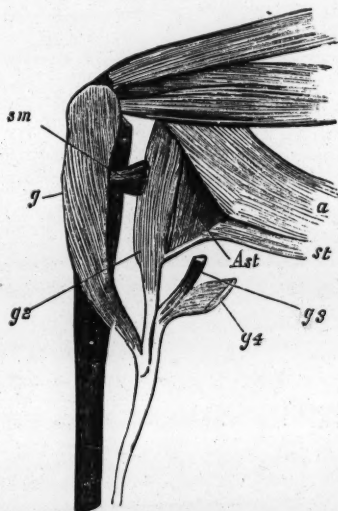
The *ambiens* is absent.

14-15. There are two *adductor* muscles.

16. The *gastrocnemius* arises by four distinct heads, which unite about half way down the leg into a broad flat tendon gradually narrowing until its insertion:—(a) The external head arises from the under surface of the femur; it is tendinous on the inner side, where it fuses with the outer loop of the biceps sling. (b) The second head arises from the femur by a thin flat tendon below the origin of the last. (c) The third head arises from the inner side of the under surface of the femur; it is fused with the inner of the two adductor muscles at its origin; about half way down it receives the tendon of the conjoined *semitendinosus* and *accessory semitendinosus*. (d) The inner head is the largest; it arises from the

femur just ventral to the insertion of the sartorius from the fascia covering the fore part of knee and for some distance below from the cnemial crest of the tibia, and from the fascia between it and the *tibialis anticus* near the upper end of the latter.

Fig. 3.

Muscles of leg of *Scopus umbretta*.

*a*, Adductor; *st*, semitendinosus; *Ast*, accessory semitendinosus; *sm*, semimembranosus; *g*, *g*<sup>2</sup>, *g*<sup>3</sup>, *g*<sup>4</sup>, gastrocnemius.

The arrangement of the *gastrocnemius* and the adjacent muscles will be understood from the accompanying figures (fig. 3).

17. The *plantaris* is a small slender muscle; it arises from the hinder part of tibia on inside of the leg posterior to the insertion of the semimembranosus.

18-19. The superficial flexor tendons are like those of other birds; the *flexor perforatus et perforans* supplying the 2nd and 3rd digits, while the *flexor perforatus* supplies the 2nd, 3rd, and 4th.

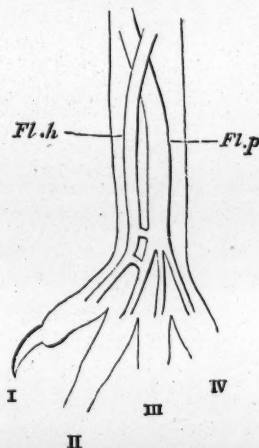
The deep tendons (see fig. 4) have rather a peculiar arrangement. 20-21. The tendon of the *flexor hallucis* is connected with the *flexor profundus* by a vinculum just before the latter divides into the tendons of the several digits; it also gives off a special slip, which joins the branch of the *flexor profundus* going to the 2nd digit.

22. There is but one *peroneus* present; it arises chiefly from the fascia covering the *tibialis anticus* and from the crest of the tibia; its

tendon gives off a broad ligament to the ankle, and then becomes fused with the tendon of the *flexor perforatus et perforans* of the 3rd digit.

23. The *tibialis anticus* is made up of two portions: the larger arises from the cnemial crest of the tibia, the smaller from the front part of the outer condyle of the humerus. The two unite to form a strong tendon, which is inserted in the usual fashion.

Fig. 4.



II  
Deep plantar tendons of *Scopus umbretta*.

*Fl.h*, Flexor hallucis; *Fl.p*, flexor profundus digitorum

24. The *extensor digitorum* is a small muscle arising from the crest of the tibia and from the front part of the bone for the space of about an inch; its tendon supplies all the digits with the exception of the first.

In the foregoing description of the muscles of *Scopus*, more attention has been paid to those which are known to vary in the different groups of birds.

In his paper on certain Muscles in Birds<sup>1</sup>, Prof. Garrod distinguished the Pelargi from the Herodiones by the presence in the former of the *ambiens* muscle, two intestinal cæca, and a double pectoral muscle; in both groups the *femoro-caudal*<sup>2</sup>, *semitendinosus*, and *accessory semitendinosus* were present. In a subsequent paper<sup>3</sup>, however, Prof. Garrod stated that the *ambiens* was not always present in the Storks, since he failed to find it in *Xenorhynchus senegalensis* and *Abdimia sphenorhyncha*; it is therefore impossible to separate the two

<sup>1</sup> Coll. Papers, p. 221.

<sup>2</sup> Absent in a few Storks, e. g. *Leptoptilus argala*.

<sup>3</sup> Coll. Papers, p. 421.

families by the presence or absence of the *ambiens*; and the fact that *Scopus umbretta* has not the *ambiens*, but has the *semitendinosus*, its accessory, and the *femoro-caudal*, is no clear indication of its affinities with either. In the condition of the *pectoral* muscle, however, *Scopus* decidedly agrees with the Ardeidæ and differs from the Ciconiidæ.

The disposition of the deep plantar tendons is not *characteristically* "Ciconiine." In all the Herons and Storks dissected by Prof. Garrod the tendon of the *flexor longus hallucis* sends down a vinculum to join the tendon of the *flexor perforans digitorum* before the trifurcation of the latter, the vinculum being extremely slender in the Herons and altogether absent in *Botaurus stellaris*. I find, however, that the condition of the deep plantar tendons in *Scopus* is exactly repeated in *Ciconia nigra*. In this bird Mr. Forbes<sup>1</sup> has figured a precisely similar arrangement to that which I have described in *Scopus*; the tendon of the *flexor hallucis* sends off a special slip to digit II. as well as a vinculum to the *flexor perforans* just before its trifurcation.

In the absence of the *expansor secundariorum*, *Scopus* agrees with *Cancroma* and *Egretta*<sup>2</sup> and the Ciconiidæ; this muscle is present in all Herons except the two genera mentioned.

The tendons of the patagium do not differ much from what is found in other Herodiones; the absence of a *biceps* slip is characteristic of both Storks and Herons.

The muscular anatomy of *Scopus*, on the whole, appears to combine the characters of both the Ciconiidæ and the Ardeidæ. On myological grounds only it would be difficult to assign it definitely to either group; in fact, the only features in which this genus especially resembles the Herons and differs markedly from the Storks are the form of the syrinx and the air-sacs, while, as already stated, the arrangement of the feather-tracts and the structure of the skeleton are more particularly Stork-like. It is clear, therefore, that *Scopus* is in many respects an intermediate type between the Ciconiidæ on the one hand and the Ardeidæ on the other; and its relation to both may be seen at a glance from the accompanying table:—

	<i>Scopus umbretta.</i>	<i>Herons.</i>	<i>Storks.</i>
Pectoral muscle .....	Not completely double.	Not completely double.	Completely double.
Ambiens .....	Absent.	Absent.	Rarely absent.
Deep plantar tendons	<i>fl. h.</i> with a special slip to dig. II. and a vinculum.	<i>fl. h.</i> with slender vinculum only, sometimes absent.	<i>fl. h.</i> with special slip to dig. II.; a vinculum (in <i>Ciconia nigra</i> ).
Expansor secundariorum.	Absent.	Absent (except in <i>Cancroma</i> and <i>Egretta</i> ).	Present.
Origin of obturator internus.	Oval.	Triangular.	Oval.
Syrinx .....	With intrinsic muscles; anterior rings of bronchi incomplete, closed by membrane.	With intrinsic muscles; anterior rings of bronchi incomplete, closed by membrane.	Without intrinsic muscles; rings of bronchi complete.
Cæca .....	2.	1.	2.

<sup>1</sup> MSS.<sup>2</sup> Garrod, Coll. Papers, p. 329.

The facts contained in this paper appear to me to be an additional reason for uniting together the Storks and Herons more closely than was done by Garrod; and the classification adopted by Mr. Selater in the most recent edition of the 'List of Animals,' so far as this is concerned, expresses the facts. But it might be advisable to separate *Scopus* as the type of a family Scopidae, equivalent to both the Ardeidae and the Ciconiidae, and to place it between them as an indication that it forms a connecting link. It is not impossible that *Balaniceps* should also be included in this family.

4. Note on the Presence of an Anterior Abdominal Vein in *Echidna*. By F. E. BEDDARD, M.A., F.R.S.E., Prosecutor to the Society.

[Received November 11, 1884.]

Although several excellent memoirs upon the various systems and organs of *Echidna* have from time to time appeared, there remain a considerable number of details of the structure of this most interesting mammal that require investigation. The death of the female specimen lately living in the Society's Menagerie has given me the opportunity not only of preserving certain parts for histological examination, but also of studying the anatomy of the animal in a fresh condition. In this way I have been able to make out a structural point which I believe has not been yet recorded, and which appears to me to be of some interest—that is, the presence of an *anterior abdominal* or persistent *allantoic* vein.

In the excellent account given by Prof. Balfour, in his 'Comparative Embryology,' of the development of the venous system in Vertebrata, I find the following statement:—"The venous system<sup>1</sup> of mammals differs in two important points from that of Reptilia and Amphibia. . . . The anterior abdominal vein is only a foetal vessel forming during foetal life, the allantoic vein." With regard to its subsequent history in Mammalia, Prof. Balfour says<sup>2</sup>:—"The allantoic (anterior abdominal) veins are originally paired. They are developed very early, and at first course along the still widely open somatic walls of the body, and fall into the single vitelline trunk in front. The right allantoic vein disappears before long, and the common trunk formed by the junction of the vitelline and allantoic veins becomes considerably elongated. This trunk is soon enveloped by the liver . . . At the close of foetal life the allantoic vein becomes obliterated up to its place of entrance into the liver . . . Owing to the allantoic (anterior abdominal) vein having merely a foetal existence, an anastomosis between the iliac veins and the portal system by means of the anterior abdominal vein is not established."

In the Reptilia and Amphibia, on the other hand, the anterior abdominal veins are represented in the adult condition as well as during foetal life.

In the Amphibia, as in the Mammalia, there are at first two abdo-

<sup>1</sup> Comparative Embryology, vol. ii. p. 541.

<sup>2</sup> *Ibid.* p. 546.

minal veins which unite behind into a single trunk after receiving branches from the allantoic bladder, and two branches (epigastric veins) from the iliac veins; anteriorly the right vein atrophies, and the left is distributed to the liver.

† In the Saurians there are also primitively two allantoic veins. "They unite with two epigastric veins (homologous with those in Amphibia), which connect them with the system of the posterior cardinal veins. The left of the two eventually atrophies, so that there is formed an unpaired allantoic vein. This vein at first receives the vena cava inferior close to the heart, but eventually the junction of the two takes place in the region of the liver, and finally the anterior abdominal vein (as it comes to be after the atrophy of the allantois) forms the portal system and breaks up into capillaries in the liver." In the Crocodiles and Chelonians both anterior abdominal veins appear to persist. I have quoted these passages from Balfour because they express clearly, and at the same time briefly, the relations of the anterior abdominal vessels in the adult as well as the fœtus of the various groups of Vertebrata, and may serve for comparison with the following account of what appears to me to be a similar structure in *Echidna*. On opening the body-wall of *Echidna* I at once noticed the presence of a large vein running along the ventral wall of the body in very close connexion with it; posteriorly this vessel (which was very conspicuous from being full of blood, and was no mere fibrous ligament) arises from a vascular network upon the under surface of the bladder. Anteriorly the vein passes down from the body-wall and is distributed to the left half of the liver. I am not able to state with certainty whether there is any connexion with the veins of the limbs, but am inclined to believe that there is not.

There seems to me to be no doubt that this blood-vessel really corresponds to the anterior abdominal vein of the lower Vertebrata and to the allantoic vein of the mammalian fœtus; its occurrence in *Echidna* is another fact among many which show that the Monotremata have preserved more of the ancestral characters than any other family of the Mammalia.

5. On five new or little-known Species of East-African Birds, represented in Mr. H. H. Johnston's First Collection from the Kilimanjaro District. By Captain G. E. SHELLEY, F.Z.S.

[Received November 5, 1884.]

(Plate LI.)

Mr. Johnston's first collection of 94 skins having been placed in my hands by the Kilimanjaro Committee of the British Association, I have considered it advisable, not only to describe at once three species which I consider new, but also two others which are well represented in the present valuable collection, and have been



J. G. Meulemans lith.

NECTARINIA REICHENOWI.

Hanhart imp.



only recently shortly characterized in the 'Journal für Ornithologie.'

Of the remaining thirty-three species of which this collection contains examples, I hope to treat at some future time, when Mr. Johnston has returned from his exploration of this high mountain-range, and has brought home the rest of his specimens.

1. *MUSCICAPA JOHNSTONI*, sp. n.

Kilimanjaro, ♀, 6000 feet.

Entire upper parts uniform slaty blue; wings and tail slightly browner and darker, the feathers edged with the same colour as the back. In front of the eyes, cheeks, and lower portion of the ear-coverts ashy white; owing to the state of the skin I cannot confidently define the exact limits of the ashy white on the sides of the head. Chin, throat, and sides of the body ashy grey, fading into ashy white on the remainder of the breast and abdomen, and almost into white on the thighs and under tail-coverts; axillaries and under wing-coverts white; under surface of the quills slaty brown, fading into buffish white on portion of their inner margins. Bill apparently leaden-grey, with a buff patch extending over about two thirds of the base of the culmen, and with the tip black. Legs brownish black. Total length 6 inches, culmen 0.5, wing 3.35, tail 3, tarsus 0.9.

Owing to the indifferent state of the skin, I keep this species in the genus *Muscicapa*, although it does not agree with that nor with any other of the genera recognized by Mr. Sharpe (Cat. B. Brit. Mus. vol. iv.). It has long, well-developed rictal bristles, and a broad but unusually deep bill, which is almost as deep as wide at the front of the nostrils. In general appearance it comes nearest to *M. caerulescens*, Hartl., and *M. cinerascens*, Sharpe, but differs from both in its larger size, very much darker colouring, and in the bill and under wing-coverts.

I have named this fine and very distinct new Flycatcher after its discoverer, Mr. H. H. Johnston.

2. *NECTARINIA KILIMENSIS*, sp. n.

Kilimanjaro, ♂, 5000 ft.

Very similar to *N. tacaze*, but differs as follows:—Head and neck metallic green, glossed with copper, and shading into fiery copper on the back; scapulars and upper tail-coverts with a greenish shade, but no lilac reflections; wings and tail brownish black with no blue shade; metallic edges of the tail-feathers lilac bronze, not greenish blue. Chin and throat metallic coppery green, not passing into metallic lilac on the front of the chest, which, with the remainder of the underparts, is dull black. Bill rather more curved, and the tail slightly more graduated. Total length 8.7 inches, culmen 1.15, wing 2.9, tail 5.6, tarsus 0.75.

Kilimanjaro, ♀, 4000 ft.

Very similar to *N. tacaze*, but with the throat less olive and of a

browner buff shade, and it has apparently a less distinct eyebrow. Total length 3·3 inches, culmen 0·95, wing 2·55, tail 1·3, tarsus 0·75.

Besides the specimens above described, the collection contains seven adult males and one female from elevations varying from 3000 to 5000 feet. The characters of the bill (which is rather more curved than in *N. tacazze*), and of the tail (which is rather more graduated), combined with the fiery copper colouring of the back and upper tail-coverts, and the absence of any lilac band between the colours of the throat and the black of the breast, indicate that its place is between *N. tacazze* and *N. reichenowi*.

I have named this bird after its locality, as I expect it will prove to be a very local form.

### 3. NECTARINIA REICHENOWI. (Plate LI.)

*Drepanorhynchus reichenowi*, Fischer, J. f. O. 1884, p. 56.

A male and two females of this species, of which the male only was described by Dr. Fischer.

Kilimanjaro, ♂, 4000 ft.

Entire head, neck, back, scapulars, least and median wing-coverts fiery copper, with slight lilac reflections at the ends of some of the feathers, and, when viewed in a certain light, with greenish reflections; remainder of the plumage brownish black; all the quills and tail-feathers very broadly edged with chrome-yellow; the primary-coverts and greater wing-coverts less broadly edged with chrome-yellow, the edges of the greater coverts changing into metallic lilac towards their ends. Bill and legs black. Total length 8·2 inches, culmen 1·2, wing 3·1, tail 5·4, tarsus 0·75.

Kilimanjaro, ♀, 5000 ft.

Very similar to the female of *N. tacazze*, excepting that it has broad deep yellow edges to all the quills and tail-feathers, and the wing-coverts edged with olive-yellow. Total length 3·1 inches, culmen 1·1, wing 2·6, tail 2·2, tarsus 0·65.

There is also a second female in the collection.

The skins do not enable me to detect the actual junction of the metallic throat and the black breast of the male, nor can I describe the sides of the head in the female.

The proposal of the distinct generic name *Drepanorhynchus* for this species appears to me quite superfluous. The bill is certainly more curved than in *N. famosa*, but in that respect *N. kilimensis* is exactly intermediate; in the gradation of the tail-feathers *N. kilimensis* is similar, and *N. tacazze* is just intermediate between it and *N. famosa*. The centre tail-feathers are as broad in the present species as in *N. famosa*.

### 4. PRATINCOLA AXILLARIS, sp. n.

Kilimanjaro, ♂, 7000 ft.

Upper parts, entire head, chin and throat black, most of the feathers of the back partially edged with brown; sides of the neck,

inner median and inner greater coverts, basal third of the outer webs of the inner secondaries, rump and upper tail-coverts white, a few of the latter slightly tipped with rufous brown, a few with black elongated terminal shaft-spots: some of the outer tail-feathers have very narrow white ends; across the crop a broad chestnut collar; remainder of the under parts white with the axillaries black like the under wing-coverts, and both very partially tipped with white; under surface of the quills slaty black with very narrow, almost obsolete partial pale edges to their inner webs. Bill and legs black. Total length 5·2 inches, culmen 0·45, wing 2·75, tail 2·4, tarsus 0·9.

Kilimanjaro, ♀, 7000 ft.

Upper parts dark brown, with broad rufous-buff edges to the feathers; with white on the wing, rump and upper tail-coverts as in the male but partially washed with rufous-buff; forehead, sides of the head, and entire under parts sandy rufous, darkening into cinnamon on the crop. Bill and legs black. Total length 4·5 inches, culmen 0·4, wing 2·6, tail 2·3, tarsus 0·9.

In the collection there are five other specimens, from 5000 to 8000 ft.

In some the white breast is slightly mottled with rufous or buff.

I have not seen an adult of *P. maura* (Pall.), which is, I believe, the only other *Pratincola* with black axillaries; but judging from Mr. Seebohm's description of that bird (Cat. B. Brit. Mus. iv. p. 188), the present species differs in not having any white tips to the scapulars, in the under surface of the quills not having any white bases, and their inner webs having only obsolete pale partial margins. These latter characters of the under surface of the quills, combined with the black axillaries and comparatively narrow chestnut collar, render it a very well-marked species.

With the wings closed *P. axillaris* is strikingly similar to *P. sybilla* from Madagascar, but on opening the wings it will be distinguished at a glance.

5. *SYCOBROTUS REICHENOWI*, Fischer, J. f. O. 1884, p. 180.

Kilimanjaro, ♂, 5000 ft.

Forehead and crown golden yellow, with a faint rufous tinge; back of the head, back of the neck, back and scapulars uniform brownish black, passing into olive-yellow on the rump; upper tail-coverts olive, passing more or less into brownish black; tail olive-brown; wings brownish black: a few of the longer lesser coverts have narrow yellow ends, the median series all broadly tipped with buffish yellow, with which colour the greater coverts and a few of the inner secondaries are broadly margined; primary-coverts and quills edged with olive-yellow. Entire underparts, lores and sides of the neck golden yellow, slightly darker on the lores, chin, and throat; in front and round the eyes and the ear-coverts black; under wing-coverts buffish yellow, partially mottled with brownish black; under surface of the quills brown, broadly margined on their inner webs with yellowish buff. Bill black; legs brownish

flesh-colour. Total length 6·2 inches, culmen 0·7, wing 3·3, tail 2·7, tarsus 0·9.

Kilimanjaro, ♀?, 5000 ft.

Similar, excepting that the entire upper half of the head is black, and the rump and upper tail-coverts more uniform olive.

Besides those described above there are four more specimens, one from 6000 feet. Two have yellow, and two black crowns, and one yellow-crown specimen is labelled ♀, all the others being marked ♂.

As the sexes marked on the labels seem to be frequently incorrect, I have disregarded them in my descriptions, and followed Dr. Fischer, who separated these two forms as sexes, upon what I presume to be good authority.

6. On the Geographical Distribution of *Huhua nipalensis*,  
Hodgs.; with Remarks on this and on some allied  
Species. By JOHN HENRY GURNEY.

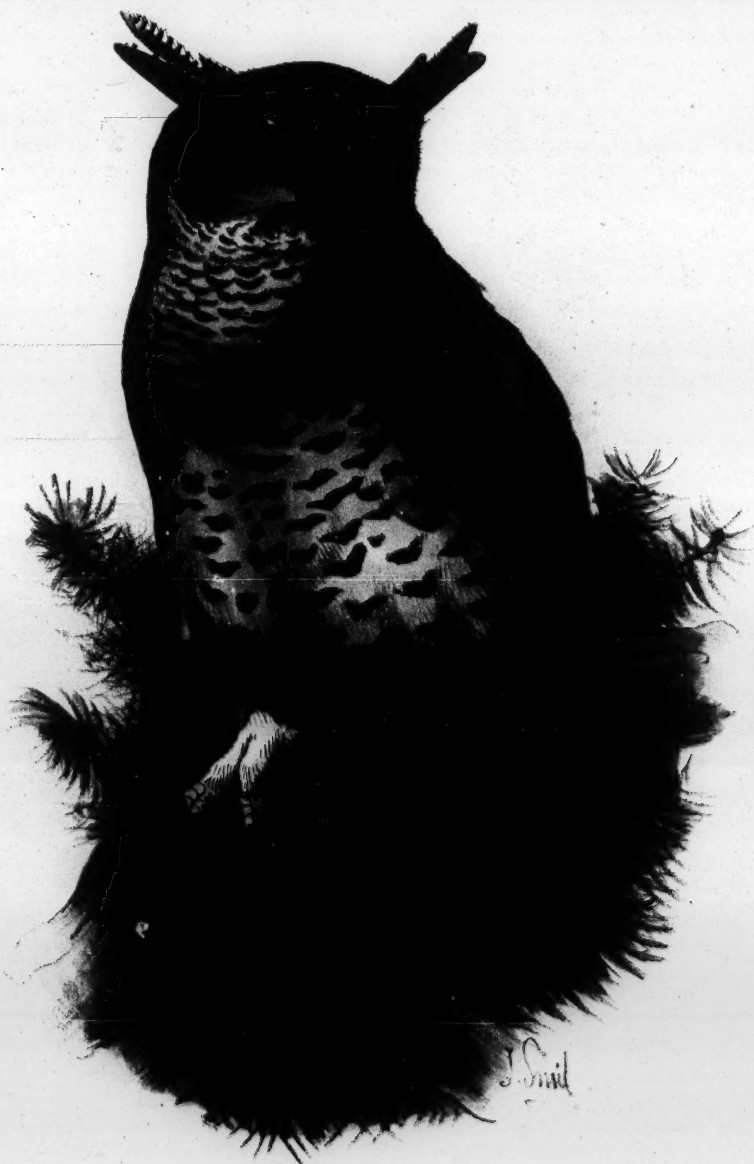
[Received November 8, 1884.]

(Plate LII.)

The fine Owl, of which the accompanying sketch (Plate LII.) is a portrait, was captured in or about the month of February 1877, when it was a newly-fledged nestling, on a precipitous ledge of a lofty mountain in the Karennee Country to the north-east of Pegu. It has lived in the Society's Gardens since September 1878, having been presented at that date by Mr. Charles Fowler, from whose information I made a note at the time of the circumstances of its capture. It was originally recorded in the Society's 'Proceedings' for 1878, p. 790, under the appellation of *Bubo (Huhua) orientalis*; but there is no doubt that it is in reality an example (now fully adult) of the nearly allied, but larger and more northern species, *Huhua nipalensis*.

It is remarkable that no figure of this very large and handsome Owl has hitherto existed, with the exception of that published by the late Dr. Jerdon under the title of *Huhua pectoralis*, which is probably referable to it; but as this is at present a doubtful point, the accompanying figure, drawn from the life, will be acceptable to ornithologists as a reliable representation of one of the finest of the Eastern Owls.

The present is probably the most eastern example of *Huhua nipalensis* of which the locality has as yet been ascertained, as there appears to be considerable doubt whether a young Owl obtained by Col. Tickell on the Mooleyit mountain in Tenasserim belonged to this species, or to its congener *Huhua orientalis*. Mr. Blyth held the former opinion in the 'Ibis' for 1872, p. 89, and Mr. Hume advocated the latter in 'Stray Feathers,' vol. vi. p. 31.



J. Smit lith.

Hanhart imp.

HUHUA NIPALENSIS.



Captain R. G. Wardlaw Ramsay possesses a specimen of *Huhua nipalensis*, in immature dress, which was shot at Tonghoo, a locality nearly as far eastward as that from which the bird now in the Regent's Park was obtained.

Col. Godwin-Austen has recorded a much more northern specimen of *H. nipalensis*, which was obtained in the Darrang district of Assam (*vide* Journal of Asiat. Soc. of Bengal, vol. xlv. pt. 2, p. 68).

As regards the occurrence of this Owl in the countries to the west of Assam, a specimen from the Tista Valley in Sikkim has been recorded by Mr. Blanford in the Journal of the Asiatic Society of Bengal, vol. xli. pt. 2, p. 154; and its original discoverer, Mr. Hodgson, states in 'Asiatic Researches,' vol. xix. p. 173, that it is found "in all parts of the kingdom" of Nepal.

Major Fitzgerald obtained a young Owl of this species "from the nest in a tree in the Darjeeling District," in recording which he states that though "not a common bird, it is met with in most parts of the Himalaya in the more temperate valleys" (*vide* 'Ibis,' 1878, p. 119).

*Huhua nipalensis* has not, so far as I am aware, been specifically recorded from any locality in Central or Southern India, but Dr. Jerdon obtained an Owl which may probably have been of this species in "high forest in Malabar." This specimen is unfortunately not now forthcoming, and until another one from Malabar can be obtained, its identity with *H. nipalensis* must remain an open question. It was described and figured by Dr. Jerdon, as already mentioned, under the name of *Huhua pectoralis*, in the Madras Journal, vol. x. p. 89, pl. 1.

The presumption in favour of the Malabar bird being identical with *Huhua nipalensis* is, however, strengthened by the fact of the latter species being an inhabitant of Ceylon. The average size of Ceylonese specimens appears to be slightly less than that of individuals from the Himalayan countries, but the difference seems not to be sufficiently marked, or sufficiently constant, to establish a subspecific distinction between the race inhabiting Ceylon and that found in the Himalayas (*vide* Legge's 'Birds of Ceylon,' p. 132).

Mr. Hodgson, in describing *Huhua nipalensis*, noted the peculiarities on which he proposed to found his subgenus *Huhua*, in vol. xix. of 'Asiatic Researches,' pp. 172, 173; and a fuller description of them, prefixed to an article on the same species, will be found in Dr. Jerdon's work on the 'Birds of India,' vol. i. p. 131. These descriptions apply more particularly to the Asiatic species of the section of the genus *Bubo* having dark irides; but in most respects they are also applicable to some African Owls to which I propose shortly to refer. The Asiatic species of the subgenus *Huhua* are *H. nipalensis*, Hodgs., and *H. orientalis* (Horsf.). The latter bird, which was figured by Temminck in the Pl. Col. plates 174, 229, under the name of "*Strix strepitans*," is an inhabitant of Southern Tenasserim, the Malay peninsula, Borneo, Sumatra, Java, and Bangka. The late Professor Schlegel remarked (Mus. Pays-Bas, *Oti*, p. 13) that specimens from the last-named

island are of smaller size than those from other localities, and proposed for them the subspecific designation of "*orientalis minor*;" but in his 'Review,' subsequently published, he stated at p. 5 of the "*Aves Noctuae*" that this small race also inhabits Borneo and the Malay peninsula, and this is somewhat corroborated by the circumstance of a specimen from North-west Borneo, recorded by Mr. Sharpe in P. Z. S. 1879, p. 245, agreeing in its wing-measurement with the smaller rather than with the larger race. On the other hand two individuals from the Barison Mountains in Sumatra, which are preserved in the Norwich Museum, agree in their dimensions with the larger form.

The African species which appear to belong, more or less closely, to the same group as the two Asiatic Owls above referred to are the following:—

**HUHUA POENSIS** (Fraser), figured by Dr. Sclater, P. Z. S. 1863, pl. 33, and by Mr. Sharpe, Ibis, 1869, pl. 4.—*Hab.* Guinea, extending southward to the R. Gaboon, and also occurring in Fernando Po.

**H. LACTEA** (Temm.), figured by Temminck in Pl. Col. pl. 4.—*Hab.* Most of the forest-regions of Africa, south of the 20th degree of north latitude.

Mr. Sharpe in his Catalogue of Striges, p. 35, has shown, I think, satisfactorily that the southern specimens of this Owl, for which the subspecific appellation of "*verreauxi*" was proposed by Bonaparte, are not really separable from the typical *H. lactea*, which was originally described from an example obtained in Senegal. I mention this, as I expressed a contrary opinion in the 'Ibis,' 1868, p. 148.

**H. CINERASCENS** (Guér.), figured by Des Murs in the Zoology to Lefebvre's 'Voyage en Abyssinie,' pl. 4.—*Hab.* Between about the 4th and 16th degrees of north latitude. I suspect, however, that the Owl recorded by Du Bocage in the 'Ornithologie d'Angola,' p. 58, as "un mâle adulte du *B. maculosus* reçu du Humba, l'indication 'iris brun' écrite de la main de M. d'Anchieta," may in fact have been an example of *H. cinerascens*, which, in that case, ranges much further south than the limits above noted.

*Huhua cinerascens* agrees with *H. nipalensis*, *H. orientalis*, *H. poensis*, and *H. lacteus*, in having a dark brown iris; but it differs from them in having the bill black, with the tip only of a yellowish horn-colour, instead of the whole bill being horn-yellow. It is also worthy of remark that the upper eyelid is more or less pink and bare of feathers in all the above-named species except in *H. orientalis*, in which the eyelid has been recorded as yellow by Mr. Davison in 'Stray Feathers,' vol. vi. p. 31.

In plumage *H. cinerascens* very closely resembles *Bubo maculosus*, and though the dimensions of the specimens of *H. cinerascens* which I have examined are slightly less than those of *B. maculosus*, it is not easy to distinguish the former in the skin from the smaller

males of the latter. But when alive, *H. cinerascens*, with its dark brown iris and naked reddish-pink upper eyelid, may be distinguished at a glance from *B. maculosus*, in which the normal colour of the iris is yellow and the upper eyelid closely clad with short feathers that usually entirely cover it, though occasionally the covering is slightly imperfect towards the anterior corner of the eye, showing the colour of the eyelid to be black.

Two other African Owls must here be mentioned. One of these is that very fine and scarce species from the Fantee Country in Western Africa, which was described by Messrs. Sharpe and Ussher in the 'Ibis,' 1872, p. 182, under the name of "*Huhua shellyi*," and was subsequently figured by Mr. Sharpe in his Catalogue of Striges, pl. 2, under that of "*Bubo shellyi*." This noble Owl has the bill yellow, which is unfortunately not shown in the figure, but the colour of the irides has not, so far as I am aware, been yet ascertained. The other species to which I propose to allude, "*Bubo leucostictus*" of Hartlaub, is also West-African, its range extending from the Gold Coast to the River Gaboon. This Owl has a yellow bill, but its irides are also yellow, as recorded by the late Professor Schlegel in his work on the 'Muséum des Pays-Bas,' *Oti*, p. 16. I am indebted to Dr. F. A. Jentink, of the Leyden Museum, for obligingly calling my attention to the circumstance of Professor Schlegel's accuracy in this statement having been subsequently confirmed by Dr. Anton Reichenow's record of a young Owl of this species which he obtained in the Camaroon mountains, and described as having the iris pale yellow, and the bill, cere, and claws yellow (*vide* Journ. für Orn. 1874, p. 387). This interesting species is, I believe, still unfigured.

---

December 2, 1884.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during the month of November 1884:—

The total number of registered additions to the Society's Menagerie during the month of November was 82. Of these 4 were obtained by birth, 39 by presentation, 28 by purchase, 3 by exchange, and 8 were received on deposit. The total number of departures during the same period, by death and removals, was 105.

The most noticeable additions during the month were:—

1. A pair of Tasmanian Wolves (*Thylacinus cynocephalus*), obtained by purchase from Mr. B. Crowther of Launceston, Tasmania, and received November 14th, being the first specimens of this animal received since the pair presented by Mr. Ronald Gunn in 1863.

I have already alluded (see P. Z. S. 1883, p. 252) to the exertions

we have lately been making to obtain living examples of this rare Marsupial. Of two pairs forwarded to the Society during the present year, one by Mr. Le Souëf of Melbourne, and the other by Mr. B. Crowther, the latter only reached us alive. These animals are apparently nearly adult, in good condition, and seem likely to do well.

2. An example of the Red-tailed Amazon (*Chrysotis erythrura*), being the second we have received of this rare species, of which the locality has not yet been ascertained (see P. Z. S. 1880, p. 23, pl. ii.).

---

Mr. Sclater called the attention of the Meeting to the death, on the 5th of July last, of the specimen of the Greater Vasa Parrot (*Coracopsis vasa*), presented by the late C. Telfair, Esq., on July 25, 1830, and which had thus passed nearly 54 years in the Society's Gardens. The sex was determined by the Prosecutor to be female; the ovaries had disappeared, but the oviduct (left) was conspicuously present; the large size of the cloaca was remarkable, and it was possible that the phenomenon described in connection with another specimen of this same Parrot (see above, p. 410) might have been due to the protrusion of the cloaca by the female bird.

Mr. Sclater further stated that he had been informed by Mr. Thomas Waters, who had passed many years collecting in Madagascar<sup>1</sup>, that he had upon one occasion shot a Greater Vasa Parrot, which had a dark fleshy mass protruding from the cloaca very much of the same description as that referred to above.

---

Mr. G. E. Dobson, F.R.S., exhibited and made remarks on a diagram designed to illustrate the evolution of the Mammalia according to the system put forward by Prof. Huxley.

---

A communication was read from the Rev. A. M. Norman and the Rev. T. R. R. Stebbing, containing the first portion of a memoir on the Crustacea Isopoda dredged during the expeditions of the 'Porcupine,' 'Lightning,' and 'Valorous.' The memoir contained descriptions of the representatives of the three families Tanaidæ, Apseudidæ, and Anthuridæ obtained during the several expeditions. A great number of new forms, chiefly from deep water, including several new genera (*Sphyraphus*, *Alsotanais*, and *Tunaella* among the Tanaidæ, and *Anthelura*, *Hyssura*, *Cyathura*, and *Calathura* among the Anthuridæ), were described.

This paper will be printed entire in the Society's 'Transactions.'

---

The following papers were read:—

<sup>1</sup> Cf. P. Z. S. 1875, p. 62, et 1879, p. 767

1. Studies in the Holothuroidea.—V. Further Notes on the Cotton-Spinner. By Prof. F. JEFFREY BELL, M.A., Sec. R.M.S.

[Received November 1, 1884.]

Owing to the kindness of Mr. Snell of Truro, who has, on two occasions, been so good as to forward me specimens of the Cotton-Spinner, I am able to give some little further information with regard to the characters of this incompletely-known Holothurian. Unfortunately, however, all the trouble and care that has been taken has not been rewarded by the arrival of living specimens in London; the investigation into the physiology of this interesting form and the complete knowledge of its minute structure, which is best gained from a study of perfectly fresh specimens, will, I doubt not, be undertaken at the Biological Laboratory soon to be erected at Plymouth.

The specimens forwarded to me came from Durgan, a fishing-village seven miles from Falmouth, where they are reported to be abundant at a depth of 10 to 20 fathoms; they appear to be objects of superstitious dread to the fishermen, who always throw overboard the "Sea-cows," as Mr. Snell says they call them.

When still comparatively fresh, *Holothuria nigra* is seen to be of a bright yellow colour beneath, and has the suckers distributed with fair regularity over that surface, though a bare patch is often apparent anteriorly; the dorsal surface is black, slimy, and papillose, but without suckers; the cuticle is exceedingly thin, and often comes off in flakes, leaving patches of a more dead hue exposed. The lower surface is flattened, and the upper slightly convex; or the whole creature may be more rounded or sausage-shaped. The cloacal orifice looks upwards. The body-wall is firm and smooth, but varies in the extent to which it is slimy to the touch.

In a specimen which was more or less flattened the length was observed to be 165 mm., and the breadth of the body 38; a sausage-shaped example measured 135 mm., and had the greatest girth of its body 120 mm., so that it was very stout.

After standing in alcohol (40 per cent. over proof) for an hour, specimens were observed to have stained the fluid; the solution was fluorescent, giving a greenish colour with reflected and a yellow with transmitted light. This colour does not seem to be lost by exposing the alcohol to sunlight; at any rate, it has not disappeared after an interval of more than six weeks' exposure to daylight.

Like many other characteristic colouring-matters, that of the Cotton-Spinner does not present us with any absorption-bands. As will be shown, however, it has some very striking resemblances to the colouring-matter described by Prof. Moseley as antedonin<sup>1</sup>.

<sup>1</sup> Quart. Journ. Micr. Sci. xvii. 1877, p. 8 *et seq.*

After treatment with strong hydrochloric acid the alcoholic solution becomes yellowish in reflected as well as in transmitted light: it becomes dirty yellow on the addition of ammonia, and throws down a turbid precipitate which gradually became more and more flocculent; this was at first of a dirty white colour, but became yellow on standing for a short time. Just as in the case of antedonin, the precipitate from the ammoniacal solution was very abundant, but, unlike it, the solution was much less strongly coloured after the deposition of the precipitate. After filtration the precipitate was left as a yellowish powder, which was insoluble in water or alcohol, but dissolved pretty readily in acidified alcohol; in this point it again resembles antedonin. After solution in acidified alcohol, the precipitate became of a faint yellow colour, but did not give a green reflection. Further addition of alkaline reagents to the filtered alcohol produced a further precipitate.

On the whole, then, it is clear that there is in *Holothuria nigra* a colouring-matter of the same character as antedonin: but if the body now under consideration has distinctive absorption-bands, they are in the Cotton-Spinner obscured by another colouring-matter, which is especially richly deposited at the distal or attached end of the Cuvierian tubes, and which readily, after solution in alcohol, stains the human skin yellow. The viscera are at least as much as the integument the seat of the antedonin-like colouring-matter, for spirit which has only come into contact with the viscera is as distinctly yellow and green as is that in which the whole of the body is preserved. Here again, then, we have an example of that diffusion of colouring-matter through the tissues of an Echinoderm to which Prof. Moseley has, in the paper cited, already directed attention.

The fact that the threads of the Cuvierian organs swelled out in water led me to try and see if I could detect the presence of mucin. No response, however, in that direction was given by the ordinary experiment of adding to the water, in which some tubes had been standing for more than ten days, solid chloride of sodium, nor did I get any precipitate with acetic acid. Shortly after death the threads are hardly at all sticky, but after a few days' treatment with strong salt solution they become much more so; the threads are quite well preserved from putrefaction, even in hot weather, by being placed in strong salt solution: a solution not carefully sheltered from atmospheric air harboured but few bacteria after being some ten weeks in a not over-clean room. If, however, the threads are left in seawater or exposed to the air they rapidly undergo putrefaction, and give off a more offensive odour than any other decomposing animal substance with which I am acquainted.

In one specimen forwarded to me the tubes had evidently been protruded in a natural manner: a compact strand of about an inch in length and one fifth of an inch in thickness protruded from the cloacal orifice; this at its free end was frayed out into a large number of comparatively fine tubes which were attached to the seaweed in the water, and extended over about two inches in breadth. As I

pointed out at the time in 'Nature,'<sup>1</sup> about as much had been expelled as would occupy the greater part of the cloacal cavity. The information forwarded to me by Mrs. Fisher, and reported in the same journal<sup>2</sup>, is further evidence that the Holothurian is capable of emitting threads which are disagreeable to the human skin at any rate.

The histological character of these tubes has been so fully worked out by M. Jourdain and Dr. Hamann in the essays to which reference has already been made that it is unnecessary here to enter into a detailed account. I have to say, however, that what has most struck me in the tubes of *H. nigra* has been the great abundance of the connective tissue. When a tube has been drawn out to its utmost tenuity, so fine indeed as to be almost invisible to the naked eye, it is seen under a magnifying-power of 500 diameters to consist of several fine fibres; a somewhat thicker portion differs only in having the fine fibres more closely packed together. It seems, then, to be pretty clear that the elongation of the threads is due to the uncoiling of the connective-tissue fibres. When thus uncoiled they appear to have no outer epithelial coating, and it is therefore difficult to understand how they can be sticky if the glands figured by Hamann have the function that he ascribes to them. This is a point, however, that can only be worked out with living specimens, the threads *in situ*, extended, and elongated being severally and comparatively examined.

In all the specimens whose intestinal tracts were examined these organs were found to have contents formed of a slaty-grey pultaceous mass, clearly made up of decomposing material; I got no such evidence of the character of the food as was presented to Mr. Peach.

With regard to the name that should be applied to the Cotton-Spinner, the Rev. Dr. Norman informs me that he is of opinion that *H. nigra* is a synonym of *H. poli* of Delle Chiaje, or *H. tubulosa* of Sars. I cannot, however, in fresh, any more than in specimens long since preserved in spirit, detect the large spicules in the suckers by which the Mediterranean species is, as is well known, to be detected.

I am greatly indebted to the reverend naturalist for reminding me that *Holothuria intestinalis* was dredged in the Minch by Forbes and Goodsir in 1850<sup>3</sup>, and by himself in the same locality in 1866<sup>4</sup>; so that "*H. nigra*" has a fellow in the British Seas.

<sup>1</sup> Aug. 7, 1884, p. 335.

<sup>2</sup> June 26. p. 193.

<sup>3</sup> Trans. Roy. Soc. Edinb. xx. p. 309, pl. ix. fig. 1.

<sup>4</sup> Rep. Brit. Assoc. 1866, p. 195.

2. Observations on the Parasphenoid, the Vomer, and the Palato-pterygoid Arcade. By J. BLAND SUTTON, F.R.C.S., Lecturer on Comparative Anatomy at the Middlesex Hospital Medical College.

[Received November 10, 1884.]

(Plates LIII. & LIV.)

In the well-known 'Lectures on the Elements of Comparative Anatomy,' 1864, Professor Huxley, in describing the structure of the Pike's skull, draws especial attention to a bone forming part of that fish's cranio-facial axis, which up to the time of the delivery of those admirable lectures had been denominated basi-sphenoid.

Concerning this bone the Professor states:—"It differs from any of the ossifications of the basi-sphenoidal cartilage in Man, not only by extending backwards beneath the basi-occipital, but by stretching forwards beneath the pre-sphenoidal and ethmoidal cartilages to within a short distance of the anterior extremity of the cranium; and in the still more important circumstance that it is an ossification within the perichondrium, which can be stripped off, in skulls which have been macerated, or steeped for a short time in boiling water, without injury to the cartilage upon which it is developed.

"Mr. Parker has shown, in his valuable paper on *Balaniceps*<sup>1</sup>, that the so-called basi-sphenoid of birds is developed from three ossifications—a central one, the true basi-sphenoid, and two lateral and inferior centres, the 'basi-temporals' (Parker), which appear to correspond with the *lingulae* of Man. The thought readily arises that the single bone  $\alpha$  (Plate LIII. fig. 1) may correspond with these two basi-temporal ossifications. The latter, however, appear to be cartilage ossifications like the *lingulae* themselves; and upon the whole I think it will be safer, at any rate for the present, to regard the bone  $\alpha$  as peculiar to the branchiate Vertebrata and to confer upon it the special name of '*parasphenoid*'" (p. 170).

For twenty full years has the name *parasphenoid* found a place in anatomical nomenclature, and as such it will probably continue to do so, but that it is a bone peculiar to branchiate Vertebrata is an opinion unsupported by facts and altogether untenable. It is one of the objects of this paper to show that its representative in the skulls of Mammalia is the bone known as the "*vomer*."

It must of course seem presumption on my part to differ from Prof. Huxley on a subject to which he has devoted his critical mind for so many years; nevertheless, I ask for unbiassed attention, as for some years past the question has occupied my best thought and labour.

Stated briefly, the relations of the parasphenoid amount to these in the Pike's skull:—

It is a bone of membranous origin, having the shape and general appearance shown in Plate LIII. fig. 2. By its upper surface it is in relation with the under surface of the basi-occipital bone, the

<sup>1</sup> Trans. Zool. Soc. vol. iv.

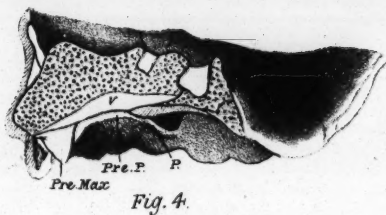


Fig. 4.



Fig. 2.

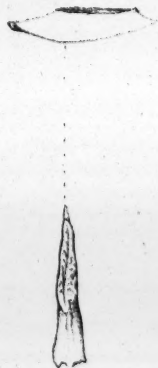


Fig. 3.

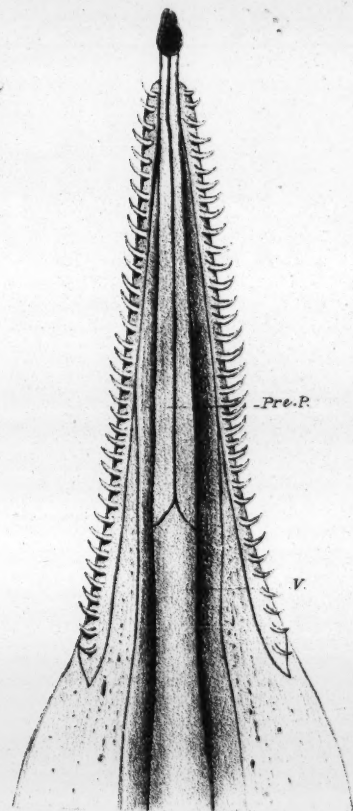


Fig. 5.

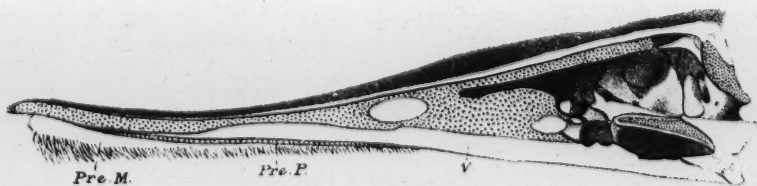


Fig. 1.

J. Smit lith.

Hanhart imp.

THE PARASPHENOID OF A FISH & THE VOMER OF MAN.



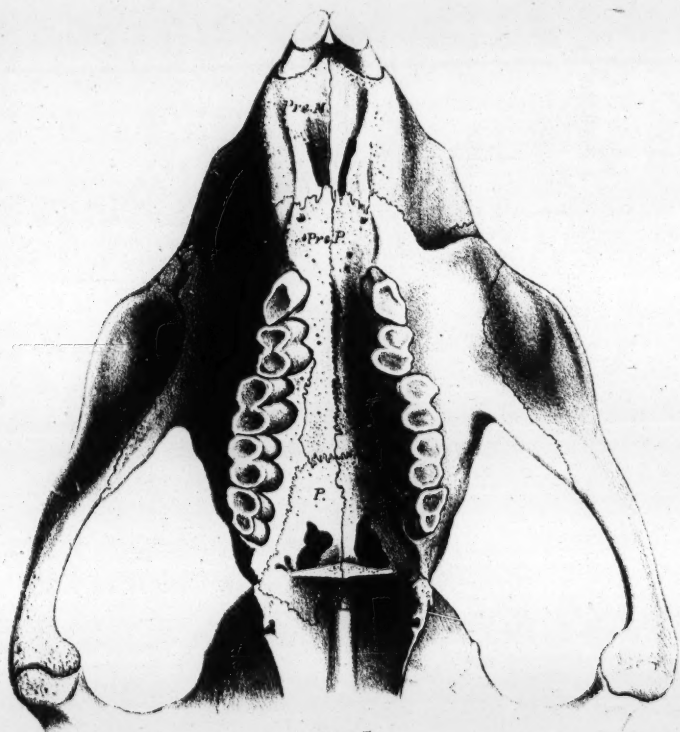


Fig. 7.



Fig. 6.

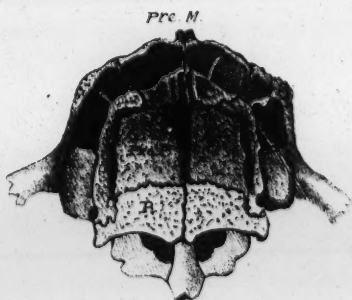


Fig. 8.

J. Smith lith.

Hanharl imp

THE HARD PALATE OF A LIZARD. WOMBAT & MAN.



basi-sphenoid, and ethmoidal cartilage; it extends the whole length of the ethmo-vomerine cartilage, and at its anterior end *rests upon* a median-placed bone carrying teeth, and usually marked "*vomer*."

The vomer of a human fœtus at the time of birth is represented in Plate LIII. fig. 3.

It arises from a single ossific nucleus which is deposited in the perichondrium covering the lower border of the ethmo-vomerine plate. It underlies the basi-sphenoidal and ethmoidal regions, and lodges the ethmo-vomerine cartilage in a shallow trough; anteriorly it ends by *resting on* two horizontal plates of bone, which in the usual condition of the parts constitute elements of the complex superior maxillary bone.

The vomer is represented *in situ*, Plate LIII. fig. 4, and the parasphenoid in fig. 1, where it will be observed that, so far as shape, situation, and relations go, the two bones correspond in a remarkable manner.

If, instead of taking a human fœtus at birth, we examine one at an earlier stage, before the hard palate is completed, we shall find that the mouth and nasal fossæ form one common cavity, the vomer forms a partial covering to the ethmo-vomerine plate, and rests anteriorly on the premaxillæ. In this condition it still more strikingly compares with the Pike's parasphenoid. Indeed, its homology is self-evident. On the other hand, to make the Pike's parasphenoid compare with the vomer of a mammal at birth, it is only necessary to widen the bones forming the anterior part of the palato-quadrate arch so as to meet the parasphenoid, or, coalescing in the median line, shut it off from the buccal cavity.

To my mind the most important feature that surrounds the parasphenoid (vomer) seems to be this:—

In crania possessing no bony basi-occipital or ossified sphenoidal region in the base of the skull, this bone plays the part of a keel to the brain-case and face (in *Menobranchus* it constitutes the floor of the cranium), and forms an important element in the structure of the skull. As ossific nuclei begin to be deposited in the basal cartilage, such bones as the basi-occipital and the basi- and pre-sphenoid are support enough in themselves; thus the function of the parasphenoid (vomer) becomes abrogated and commences to lose its relatively great importance. Take for examples *Menobranchus*, *Siredon*, and *Siren*, all of which lack a basi-occipital bone; in each of these instances the parasphenoid (vomer) extends as far backwards as the anterior boundary of the foramen magnum. In the Pike, Cod, and such fish possessing an ossified basi-occipital, the vomer only ventures as far backwards as the anterior end of that bone, merely for greater support. Ascending the scale of vertebrates and gaining mammals, we find well-ossified bones in the skull's base, of cartilage origin, strong and capable supports for the skull-vault; and the vomer is reduced to slender and delicate proportions, merely performing the insignificant duty of forming a part of the septum between the neighbouring nasal passages.

In the skull of the Frog, however, this median parasphenoid

(vomer) stops short at, and does not pass beyond, the girdle-bone. In this case it is interesting to note that the anterior portion of the skull is in no need of extraneous support, for the girdle-bone sufficiently protects the ethmoid region, whereas the region between the occipital and girdle-bones is still only cartilaginous at the base, and requires support from the dagger-like parasphenoid (vomer).

The question then arises, If the parasphenoid of the Pike and the vomer of Man are homologous, to what do the bones marked vomers in the skull of fishes and batrachians correspond? This is a broad question, and involves a consideration of several facial bones. It is to me very obvious that no small amount of confusion with regard to the morphology of the bones of the anterior region of the fish's skull has arisen from the fact, that most anatomists, who have attempted to compare the skulls of the two extremes of vertebrate organization, have not taken sufficiently into account the mode of ossification of the superior maxillæ in mammals. This is necessarily of fundamental importance in its bearing on the question; and after the excellent results Professor Huxley obtained by applying this method of research in elucidating the morphology of the various parts of the temporal bone, I was induced to work out in the same way the facial region.

To attempt to give even a résumé of all that has been written on the subject of the ossification of the superior maxillary would be a labour in itself; therefore I shall content myself by saying that from the time of Portal onwards anatomists of eminence, who have devoted any attention to the matter, have maintained that this bone arises from more than one centre.

The bones are of membranous origin throughout. The various centres are deposited so nearly at one time, and grow so rapidly, that it is an exceedingly difficult matter to determine the order of their appearance; but this affects the general result so little that the description will be commenced by a consideration of the premaxillary portion.

It is certainly very remarkable that any anatomist should be so incredulous as to doubt the origin of this interesting element from an independent centre; but such is the fact, simply because the maxillo-premaxillary suture, so evident on the palatal aspect of skulls up to end of the first dentition, is obliterated very early on the facial surface of the bone, due to a deposition of osseous material from the periosteum. The segment may be thus described:—

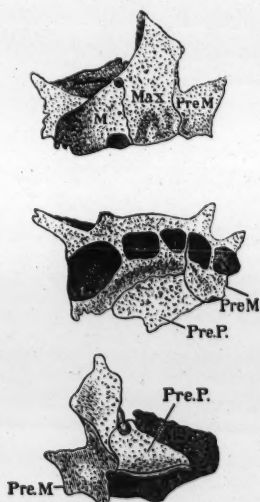
It comprises that portion of the superior maxilla which lodges the two incisor teeth; from its mesial surface a horizontal piece projects backwards to form the inner boundary of the anterior palatine canal. Superiorly it has a vertical portion, which forms the lower and outer boundary of the anterior nares, and in well-marked cases it sends up a spiculum to articulate with the nasal bone.

Dr. Paul Albrecht recently communicated to the Société d'Anthropologie de Bruxelles<sup>1</sup> a paper to the effect that the premaxillary bone is, as a matter of fact, developed from two centres, and supports his view by reference to cases of cleft-palate and hare-lip. I have

<sup>1</sup> October 1882.

examined some cases of cleft-palate and can support Albrecht's statements, but in the normal condition there is only one centre for each premaxillary bone. The discrepancy may be thus explained :— the premaxilla is originally developed in membrane, and at some little distance from the median line, which, in the fœtus, is occupied by the thick cartilage known as the ethmo-vomerine plate. After a time the premaxillary ossifications involve the anterior extremity of this cartilage, so that the inner portions of these bones are really of cartilage origin. If anything interfere to prevent the premaxillary bone or bones meeting the ethmo-vomerine plate, the tip of this cartilage ossifies on its own account, and gives rise to the false notion of two independent centres occurring normally. This fact may be verified easily in the majority of mammals. In other parts of the

Fig. 1.



Three views of the human superior maxilla, to visually express the disposition of its four ossific centres.

M. Malar centre, Max. Maxillary centre, Pre-M. Pre-maxillary, and Pre.P. Pre-palatine centres.

skull instances of a bone arising in membrane and invading cartilage might be quoted in support of my opinion.

The next centre to be considered forms the palate process of the maxilla and a considerable portion of the inner wall. Fig. 1 represents it as an L-shaped piece of bone, forming by means of its horizontal plate the roof of the mouth, whilst its vertical plate extends upwards as far as the orbital surface of the bone.

This centre will be referred to throughout this paper as the "pre-palatine" centre.

If the orbital surface be next examined, the infraorbital groove will be found unclosed even at birth on the facial surface of the maxilla, the two sides not having united to form the canal for the transmission of the infraorbital nerve. This groove is an excellent landmark, for all that portion lying to its outer side arises from a distinct centre, whereas that part which lies between the groove and the palatal portion arises also from an independent ossific nucleus. The outer nucleus will be referred to as the "malar" portion, whereas the inner piece, constituting as it does the main mass of the bone and being hollowed out subsequently to form the antrum, will be termed the maxillary centre; at the time of birth it is a solid mass of bone with a shallow groove on its inner aspect.

It now is evident that for morphological purposes the superior maxilla consists of four distinct portions:—

- (a) The premaxillary region in relation with the ethmo-vomerine cartilage and the naso-palatine nerve.
- (b) A pre-palatine portion forming a platform for the support of the anterior end of the vomer.
- (c) A maxillary centre situate to the inner side of the superior maxillary division of the fifth nerve.
- (d) The malar piece, lying outside this nerve and supporting the malar bone.

The relations these various centres bear to one another are shown in fig. 1.

Now comes the task of selecting the centre in Man's maxillæ corresponding to the Pike's vomer, so called. Careful comparison of the two skulls convinces me that the "pre-palatine" centres of the mammalian maxillæ represent the piscine vomerine bones, for the following reasons:—

- (1) They are membrane-formed bones.
- (2) The bone in each case underlies the anterior end of the vomer and parasphenoid respectively.
- (3) Although in the Pike the so-called vomer is median and single, nevertheless in *Lepidosteus*, *Rana*, *Menobranchus*, and many other forms the bones so named are double.
- (4) In their relation to the premaxillæ and palate bones they fulfil the required anatomical conditions.

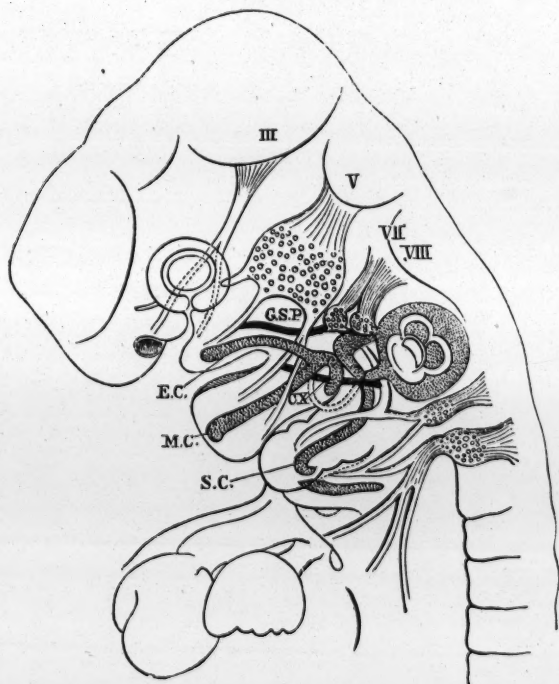
In order to bring out these facts with greater clearness I have arranged side by side in Plates LIII. & LIV. figs. 5–8 the corresponding regions in a fish (*Lepidosteus*), in a Lizard (*Lacerta agilis*), in a Wombat (*Phascolomys*), and in a human foetus at birth. It will be at once evident that the bones lying behind the premaxilla are totally different in their surroundings from the vomer of mammals, whereas there is a very close and accurate agreement if they be considered as the pre-palatine portion of the superior maxilla of mammalian anatomy.

A careful survey of these facts must convince any impartial anatomist that the bones in Fish and Amphibians usually denominated "vomeres" must part with their claims to that title and yield it to the so-called parasphenoid. It now becomes necessary to find a

fitting term for these so-called vomers. I venture to term them *prepalatine*, as indicating their anatomical relationship to the palatine bone and their affinity to the palatine portion of the superior maxilla of Mammals.

Indeed, it seems pretty clear to my mind that, without even entering into the question of development at all, so close is the anatomical harmony of the three pairs of segment—*spremaxilla*, *prepalatine*, and *palatine*—in Fish, Batrachia, Lacertilia, and Mammals,

Fig. 2.



Diagrammatic view of the Eustachian cartilage and related nerves (modified from Fraser).

E.C. Eustachian cartilage. M.C. Meckel's cartilage. S.C. Styloid cartilage. G.S.P. Great superficial petrosal nerve (vidian). C.X. Chord tympani nerve. III., V., VII., VIII. Cranial nerves.

that there need be little hesitation in acquiescing in the view here set forth.

This closes the case for the parasphenoid and the vomer.

PROC. ZOOLOG. SOC.—1884, No. XXXIX.

*The Palato-pterygoid Arcade.*

Whilst working over a considerable number of skulls of early human fœtuses, I was led to look into the early conditions of the auditory ossicles and the associated branchial bars; in the course of the investigation the following facts came to light.

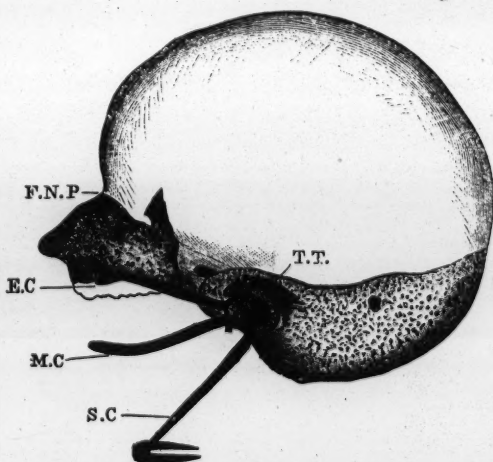
Early in fetal life, at about the time the skull begins to chondrify, there may be seen running from the malleus, and continuous with it, a rod of cartilage which extends downwards to near the extremity of the fronto-nasal cartilage. Its relation to the Meckelian cartilage and the thyroid arch is shown diagrammatically in fig. 2, where a point of considerable importance is illustrated, viz. that the nerve known in human anatomy as the great superficial petrosal or vidian, bears the same morphological relation to the 7th cranial nerve and the superior maxillary branch of the 5th as does the chorda tympani to the 7th and the inferior maxillary division of the 5th (see diagram).

To return to the bar of cartilage. Later on in development this bar undergoes metamorphosis, as follows:—

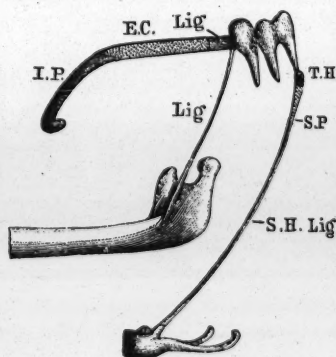
(a) The inferior end of the cartilage is ossified and is recognized

a.

Fig. 3.



b.



a. The Chondro-cranium of a human fœtus at the third month, with the associated cartilaginous bars.

F.N.P. Fronto-nasal plate. T.T. Tegmen tympani. E.C. Eustachian cartilage. M.C. Meckel's cartilage. S.C. Styloid cartilage.

b. The later modification of the arches.

1st arch.—I.P. Internal pterygoid palate. E.C. Cartilaginous portion of the Eustachian tubes. Lig. Ant. lig. of the malleus. 2nd arch.—Inf. maxilla, with long internal lateral ligament of the lower jaw. 3rd arch.—Hyoid bone. S.H. Lig. Stylo-hyoid ligament. S.P. Styloid process. T.H. Tympano-hyal and incus.

T.H  
-S.P

H. Lig





P. Smit del.

1 & 2. RANA ESCULENTA, var. LESSONÆ.  
3 " " TYPICA.

Harhart imp.

as the internal pterygoid process of the sphenoid, because later it fuses with that bone, and in the process squeezes the vidian nerve between it and the basi-sphenoid.

(b) The middle piece remains throughout life as the cartilaginous portion of the Eustachian tube.

(c) The third portion, that connected with the malleus, degenerates into fibrous tissue, and becomes the anterior ligament of the malleus, and may be seen in the adult passing from the Eustachian cartilage to the head of the malleus.

The diagrams exhibited (figs. 2 and 3, pp. 571, 572) show at a glance this transformation; and to make the picture complete the metamorphosis of the two associated cartilages has been added also.

With regard to the morphological value of this bar, it requires very little perception to see at once that it is in man the representative of the palato-quadrate of Elasmobranchs, Amphibians, &c.

In concluding let me remark that Nature fashions the most complex skull on precisely the same ground-plan as she does the simplest, and it must be evident to every thinking mind that the nearer we approach truth in these matters—"how simple do her ways appear."

#### EXPLANATION OF THE PLATES.

##### PLATE LIII.

- Fig. 1. A longitudinal section of a Pike's skull, to show the situation of the pre-maxilla, pre-palatine, and vomer (after Huxley). The terminology is altered in accordance with the views of this paper.
2. The so-called parasphenoid of the Pike disarticulated.
  3. The vomer of a human fœtus at birth.
  4. Longitudinal section of the skull of a human fœtus at term, to show the situation of the vomer.
  5. An under view of the anterior part of the skull of *Lepidosteus*, to show the two so-called vomers (pre-palatines). The pre-maxillæ have been removed (modified from Parker). In the figures 5, 6, 7, 8, the lettering is the same. Pre.m. premaxilla. Pre.p. Prepalatine. P. Palate bone.

##### PLATE LIV.

6. The skull of *Lacerta agilis*, showing the relation of the pre-maxilla, pre-palatines, palatines, and vomer.
7. Skull of Wombat, showing the relation of the bones on hard palate as in last figure.
8. Hard palate of man (fœtus at term) to show pre-maxilla, and the pre-palatine portion of the superior maxilla, and palate bone, for comparison with figures 5, 6, & 7.

#### 3. Notes on the Edible Frog in England.

By G. A. BOULENGER, F.Z.S.

[Received November 10, 1884.]

(Plate LV.)

In a communication in the July number of the 'Zoologist,' I reviewed the information collected up to that time respecting the occurrence of the Edible Frog, *Rana esculenta*, in England, and showed that the Frog hitherto found at various places (Foulmire fen in

Cambridgeshire, and Stow Bedon and between Thetford and Scoulton in Norfolk), and generally regarded as introduced from France and Belgium, belongs to the Italian form, *R. esculenta lessonae*; and concluded by expressing the hope that descendants of the typical *R. esculenta*, which was introduced in great numbers into Norfolk by Mr. G. Berney forty years ago, would be discovered. Through the kindness of Lord Walsingham, W. Amhurst Amherst, Esq., M.P., and Geo. E. Mason, Esq., who took an interest in the question, I have received much information and additional material this summer; and, what is more important, the typical *R. esculenta* has been found in or near some of the places where specimens were turned out by Mr. Berney, but where they remained unnoticed, or were confounded with the form *lessonae*, the introduction of which is clearly of a much older date. The result is the addition to the British fauna of a new form of Frog. If I say "form," and not "species," it is because the limits of these forms are difficult to establish when the whole Palearctic range is taken into consideration; but so far as England is concerned, the two forms are as distinct as many generally accepted "species." I may even add that, according to the definition of the genera *Rana* and *Pyxicephalus* (*Hoplobatrachus*) admitted by many authors, *Rana esculenta lessonae* would fall into the latter; but I have elsewhere expressed my objections to the validity of the genus *Pyxicephalus*.

Soon after the publication of my note in the 'Zoologist,' I received from Lord Walsingham seven specimens from Stow Bedon; and on July 29 I had the pleasure of accompanying his Lordship on an excursion to that place, on which occasion twelve more specimens were captured. The Frogs were very abundant at Stow Bedon, in small pools and pits, which, owing to the excessive drought, contained but little water. They did not indulge in their sonorous croaking on the occasion of our visit, and no tadpoles or spawn were to be seen. However, one full-grown tadpole was dredged from the bottom of a pit, but was so much injured that I could not preserve it. I was rather surprised to find that none of the specimens presented that beautiful green colour which is usual in *R. esculenta*; all were olive-brown, spotted and marbled with black, and provided with a pale yellow or pale green vertebral line; all had the enormous metatarsal tubercle. This accounts for the fact for which I always was at a loss to find an explanation, viz. the silence of the first discoverers of the Edible Frog in Cambridgeshire as to the green colour which, among other characters, so well distinguishes that species from the Common Frog. *R. esculenta lessonae*, as occurring in England, is never green. Lord Walsingham informed me that he was making inquiries among the people of that neighbourhood as to how long the Frogs had lived there, and that he had been assured that their existence could be traced as far as sixty years back. Lord Walsingham also inquired of Mr. G. Berney whether the Edible Frog had maintained its existence in Hockering, and was informed that for years past not one had been seen anywhere in that neighbourhood.

On a request made by Lord Walsingham to Mr. Amhurst Amherst, I received from that gentleman on August 9 two fine living

specimens, which proved to belong to the typical *Rana esculenta* as occurring in the north of France and Belgium. These came from Foulton, Norfolk, one of the very spots where the Frogs had been turned out by Mr. Berney, and of which they are, without the slightest doubt, the descendants. Both specimens were grass-green and had the moderate-sized metatarsal tubercle of the animal so graphically and accurately described by Rösel.

Shortly after, Mr. G. E. Mason made an excursion to Norfolk with the special object of ascertaining the distribution of the Edible Frog in that county. He visited Stow Bedon first, and succeeded in finding a large number of recently transformed young and others in the last stage of the tadpole, some of which he has kindly presented to the Natural History Museum.

Mr. Mason has furnished me with the following notes:—"On the common (of Stow Bedon) the species is, I think, restricted to the north-west portion; it was absent in all the ponds which are distributed over the remaining tract. This portion is undoubtedly seldom disturbed, and a number of Teal and other water-fowl had made so favourable a spot their home; this is, I think, sufficient to account for the absence of Frogs. As to the range of the species beyond Stow Common, I have unfortunately gained but little trustworthy information. During my daily rides round the adjacent districts, I availed myself of every opportunity to search for specimens and gain information; but owing to the excessive heat, and extreme dryness of the land, I found the former object a most difficult occupation. Scoulton (3½ miles from Stow Bedon station) was the only neighbourhood near Stow where I could learn the species had been observed, and, according to the testimony of a large land proprietor, they were readily found two or three years back in nearly all the ponds &c. on his estate, but since that time they have quite disappeared." Mr. Mason, having sent the gentleman just alluded to specimens from Stow Bedon, was assured they were positively identical with those of Scoulton.

Mr. Mason also caught a fine adult example of the true *Rana esculenta* on Wereham fen, nearly six miles from Foulton, and subsequently found other specimens on Foulton fen. He informs me that that form is distributed over all the fen-land in that part of the county, and is well known as the "French Frog." "I put a few specimens of *R. esculenta* from Foulton in the ponds &c. at Brandon; the surroundings are extremely favourable, and I fully expected I should have found one of the two forms there."

It is clear that the Frogs of Stow Bedon and Scoulton (and Foulmire fen, where they have disappeared for many years past) are quite distinct from those of Foulton and Wereham. Those from the latter places are certainly the descendants of Mr. Berney's importations from Paris, Brussels, and St. Omer in 1837-42. Of the introduction of the other form we have no authentic record; but as they belong to a race known to occur only in Italy, we must come to the conclusion that they were imported from that country and the suggestion of the late John Wolley, that they were introduced by the monks, appears the most plausible.

The typical *Rana esculenta* is too well known to require description; and it will suffice to refer the reader to Rösel's admirable illustrations, and to the figure appended to this note, taken from a living specimen from Foulden. The coloration varies immensely, and although the green is the most frequent, I have also seen olive-brown specimens (from Berlin) resembling very closely in colour the form *lessonea* as occurring in this country. For the latter it will be useful to give a short description, which, with the coloured figures, will enable to compare that form with other varieties of *Rana esculenta*.

Snout obtuse, with very oblique loreal regions, its length slightly exceeding the diameter of the orbit; nostril equally distant from the eye and the tip of the snout; interorbital space half the width of the upper eyelid; tympanum three fourths the diameter of the eye. Hind limb short; when the limb is stretched forwards, the tibio-tarsal articulation reaches the tympanum or not quite so far in the female, the tympanum or a little beyond in the male. Inner metatarsal tubercle very large and prominent, strongly compressed, semilunar, closely resembling the spur of *Pelobates*; its length equals nearly two thirds that of the remaining part of the inner toe. Skin smooth or feebly warty; glandular lateral fold moderately prominent, narrower than the upper eyelid. Olive-brown or bronzy brown above, spotted with black, strongly marbled on the flanks, where a light longitudinal zone remains unspotted; glandular folds lighter; the sides of the head and the ground colour of the flanks sometimes green; canthal streak well marked, black; upper lip usually bordered with black; tympanum chestnut-brown; a pale yellow or pale green vertebral line, frequently edged with black. The dark cross bands on the limbs usually very irregular; hinder sides of thighs, axilla, and groin bright yellow or orange, marbled with black. Lower surfaces more or less profusely spotted with blackish.

Dimensions.	♂	♀
	millim.	millim.
From snout to vent .....	64	78
Length of head .....	22	29
Width of head .....	22	28
Diameter of the eye .....	6	8
Interorbital space .....	2.5	3
From the eye to the nostril .....	4.5	5
From the eye to the tip of the snout .....	10	12
Diameter of the tympanum .....	4	5.5
Fore limb .....	34	42
Hind limb .....	97	110
Tibia .....	25	30
Foot (from outer metatarsal tubercle) .....	34	39
Inner toe (from inner metatarsal tubercle) ..	7.5	9
Inner metatarsal tubercle .....	5	6

#### EXPLANATION OF PLATE IV.

Fig. 1. *Rana esculenta*, var. *lessonea*, Camerano. From specimens from Stow Bedon.

Fig. 2. *Rana esculenta*, L. From a specimen from Foulden.

## 4. Notes on some Birds from Timor-Laut.

By R. SALVADORI, C.M.Z.S.

[Received November 17, 1884.]

In the July number of the 'Ibis,' p. 355, I said that, "judging from what I know of the geographical distribution of the birds in the Papuan subregion . . . several forms from Timor-Laut, described as new by Dr. Meyer, and which by Mr. Sclater have been attributed to Ké-Islands species, must be really distinct." Then I added that I thought that it would be found that such was the case with *Geofroyus timorlaoënsis* and *Philemon timorlaoënsis*; as to *Artamus musschenbroeki*, *Calornis circumscripta*, and *Ptilopus flavo-virescens* I was rather doubtful. Also I mentioned that the *Urospezias* from Timor-Laut (doubtfully attributed by Dr. Meyer to *U. albiventris*, Salvad., from Ké Islands) I suspected to belong to a different species. The same remarks I made as to the Crow from Timor-Laut, attributed by Dr. Sclater to *C. validissimus*, and also as regards the *Stigmatops* attributed to *S. squamata*, and the so-called *Dicruropsis bracteata*.

Since I wrote these remarks I have obtained from Dr. Meyer specimens of all the species mentioned but the last two<sup>1</sup>, and also of some others; and I wish to bring forward a few notes concerning the specimens examined, especially as I agree more closely with Dr. Meyer's conclusions than with those published lately by Mr. H. O. Forbes (P. Z. S. 1884, pp. 425-434).

## UROSPEZIAS, sp.

*Urospezias albiventris*, Salvad.?, Meyer, Sitz. u. Abh. Gesell. Isis, 1884 (Separat-Abdruck, p. 11); Forbes, P. Z. S. 1884, p. 426.

*Astur albiventris*, Forbes, P. Z. S. 1884, p. 431, n. 1.

Dr. Meyer has doubtfully attributed the specimens received from Timor-Laut to my *U. albiventris*, and I have already expressed my suspicion that they most likely belong to a different species.

Since then I have received from Dr. Meyer three specimens from Timor-Laut, one fully adult and two young birds.

The adult bird resembles the type from Ké Islands described by me, but it differs from it in the following points:—The grey colour of the upper parts is a little darker; the reddish colour of the chest is less vivid, being tinged with greyish; the tibiae and the under wing-coverts are purer white and not tinged with reddish.

Of the two young birds, one is like the young bird from the Ké Islands, also described by me, while the other has the fore neck darker, from the dark spots being larger and nearly confluent.

After having made these comparisons, it seems to me not improbable that the Timor-Laut specimens belong to a form distinct from that of the Ké Islands; but before deciding the point we must have large series of specimens from both localities.

<sup>1</sup> Quite recently Dr. Meyer has specifically separated the *Stigmatops* as *S. salvadorii* (Zeitschr. f. d. Ges. Orn. 1884, p. 217, Separat-Abdruck, p. 28).

## GEOFFROYUS TIMORLAOËNSIS, Meyer.

*Geoffroyus keiensis*, Sclat. (nec Salvad.), P. Z. S. 1883, pp. 51, 200; Forbes, P. Z. S. 1884, p. 431, n. 10.

*Geoffroyus timorlaoënsis*, Meyer, l. c. p. 15.

I have examined four typical specimens (two adult males, a young male, and a young female) of this species, which is really much smaller than *G. keiensis*<sup>1</sup>, and has the outer web of the first primary greenish rather than bluish; but this difference is not very noticeable. Respecting the dimensions, *G. timorlaoënsis* is intermediate between *G. keiensis* and *G. aruensis*; as to the blue under wing-coverts, it is exactly like the first. Dr. Meyer goes on pointing out other minor differences between *G. timorlaoënsis* and *G. keiensis*; but it seems probable that one more important difference, not mentioned by him, ought to be added; as, having called Dr. Meyer's attention to the colour of the head of the females, he writes that it is *never so dark* in *G. timorlaoënsis* as in *G. keiensis*. The female sent to me being a young one, with the head green like the neck, I have not been able to appreciate the value of this difference myself.

## PACHYCEPHALA ARCTITORQUIS, Sclat.

*Pachycephala arctitorquis*, Sclat. P. Z. S. 1883, pp. 55, 191, pl. xiii.; Meyer, l. c. p. 34; Forbes, l. c. p. 428.

Four specimens examined: two adult males, a male moulting, and a female.

Besides these, Dr. Meyer has sent me five typical specimens of his *Pachycephala riedeli*, of which two are marked male and female, while the other three are unsexed. My impression is that these five specimens are the young of *P. arctitorquis*; but I may be wrong. Also, from Mr. Forbes's experience it would appear that *P. riedeli* is really the young of *P. arctitorquis*.

## ARTAMUS MUSSCHENBROEKI, Meyer.

*Artamus leucogaster*, Sclat. (nec Salv.), P. Z. S. 1883, pp. 51, 195, 200; Forbes, P. Z. S. 1884, pp. 427, 432, n. 27.

*Artamus musschenbroeki*, Meyer, op. cit. p. 30.

Six typical specimens, which really differ from true *A. leucogaster*, as Dr. Meyer has pointed out. To the differences mentioned by him, I would add that the bill in all the six Timor-Laut specimens examined by me is constantly larger (0.020–0.021 metre) than in *A. leucogaster* from Java, the Moluccas, New Guinea, Aru Islands, and Australia (0.017–0.019 metre). I wish also to mention that the white tips of the rectrices in the six Timor-Laut specimens inspected by me are rather conspicuous, so much so that it certainly would have not escaped my attention when I described *A. leucogaster* if present in this species as it is in *A. musschenbroeki*.

<sup>1</sup> Mr. Forbes admits that the wing-measurements are less in Timor-Laut specimens, but, according to him, these have the total length greater than in *G. keiensis*; my experience is quite the reverse, *G. keiensis* being the largest in every respect.

## PHILEMON TIMORLAOËNSIS, Meyer.

*Philemon plumigenis*, Sclat. (nec Gray), P. Z. S. 1883, pp. 51, 195; Sharpe, in Gould's B. New Guinea, pt. xvi. pl. 13.

*Philemon timorlaoënsis*, Meyer, op. cit. p. 41.

*Philemon timorlautensis*, Forbes, P. Z. S. 1884, pp. 429, 432, n. 34.

Three typical specimens. I have at hand only one specimen of true *P. plumigenis* from Ké Islands to compare with them. They differ very slightly, having the whole head a little lighter and the sides of the head also paler, the edges of the feathers being nearly silvery whitish; the bill in the Timor-Laut specimens is thinner.

## PITTA VIGORSI, Gould.

*Pitta brachyura*, Meyer (nec Gm.), Sitzb. Isis, 1884, p. 43 (Dammar).

*Pitta vigorsii*, Meyer, Zeitschr. f. d. ges. Orn. 1884, p. 210 (Timor-Laut).

Two specimens from Dammar and Timor-Laut, which seem referable to this species; but I have not been able to compare them with specimens from Banda.

## CALORNIS CIRCUMSCRIPTA, Meyer.

*Calornis metallica*, Sclat. (nec Temm.), P. Z. S. 1883, pp. 51, 195.

*Calornis circumscripta*, Meyer, op. cit. p. 49.

*Calornis gularis*, Forbes (nec Gray), P. Z. S. 1884, pp. 430, 433, n. 41.

Five typical specimens. I am inclined to recognize *C. circumscripta* as a good species, more allied to *C. metallica* than to my *C. inornata* from Mysore. It is to be distinguished from the first, especially on account of the two violet lines which run along the branches of the under mandible on the sides of the throat and meet at the chin, so that they describe a V; besides, it has the green collar on the back of the neck narrower and the upper back is violet, with the green triangular spot in the middle, generally so conspicuous in *C. metallica*, wanting, or scarcely perceptible.

Mr. Forbes has recently stated that *Calornis circumscripta* is the same as *C. gularis*, Gray, from Mysol, hitherto only known from one specimen. I cannot agree to this identification. The type of *C. gularis*, which I have carefully examined, is only an individual variation of *C. metallica* with more purple on the throat, like other specimens from Halmahera and Cape York, examined by me. *C. circumscripta* is evidently an insular form of the widely extended *C. metallica*, like *C. inornata* from Mysore and *C. purpureiceps* from the Admiralty Islands; and I do not think it possible that the same species can be found in Mysol and in Timor-Laut, so wide apart one from the other, while true *C. metallica* lives in so many islands lying between them.

**CORVUS LATIROSTRIS, Meyer.**

*Corvus validissimus*, Sclat. (nec Schlegel), P. Z. S. 1883, pp. 21, 200; Forbes, P. Z. S. 1884, p. 433, n. 43.

*Corvus latirostris*, Meyer, Zeitschr. f. d. ges. Orn. 1884, p. 199.

One typical specimen.

I have already expressed my doubts ('Ibis,' 1884, p. 355) as to the Crow from Timor-Laut being *C. validissimus*, Schlegel. And after having seen the specimen sent me by Dr. Meyer, I fully agree with him that it has nothing whatever to do with that species, and that it is a peculiar one, allied to *C. orru*, but with a much wider lobe at the base of the bill.

**PTILOPUS FLAVO-VIRESCENS, Meyer.**

*Ptilopus xanthogaster*, Sclat. (nec Wagler), P. Z. S. 1883, pp. 51, 195, 200; Forbes, P. Z. S. 1884, pp. 430, 433, n. 47.

*Ptilopus flavovirens*, Meyer, op. cit. p. 50.

Four typical specimens, which are undoubtedly different from those from Ké Islands, Banka, and Koor, in having the neck and head more conspicuously greenish, the grey shield on the chest a little darker, and in some other minor points; but whether the differences are really specific I cannot decide. In my 'Ornitologia della Papuasia,' vol. iii. p. 6, I have already alluded to the differences, without considering them of specific value, shown by the specimens from Lettie and from Koor compared with those from Banda.

5. Description of a supposed new Species of Flycatcher, of the genus *Rhipidura*, from New Guinea. By E. P. RAMSAY, F.R.S.E., C.M.Z.S., F.L.S., &c.

[Received November 18, 1884.]

**RHIPIDURA FALLAX, sp. nov.**

*Male*. Whole of the upper and under surface black; concealed portions of the quills of the wings and tail slightly brownish; apical half of the under wing-coverts and of the axillaries silky white; bill, rictus, legs, and feet black. Total length 5·5 inches, wing 3, tail 3, tarsus 0·7, bill from forehead 0·6, from nostril 0·35, from gape 0·55.

*Hab*. Astrolabe Range of S.E. New Guinea.

*Obs*. In plumage *R. fallax* resembles Salvadori's description of *R. brachyrhyncha* of Schlegel, but there is no trace of white over the eye in the present bird.

The feathers on the *forehead* and *loreal* region are *erect* and the tips slightly glossy; a very slight metallic gloss on the head and chest. The bill is stout and strong, arched to the tip, where it is laterally compressed. On the whole this bird has the appearance of a miniature *Dicrurus*, and may have to be placed in a new genus.



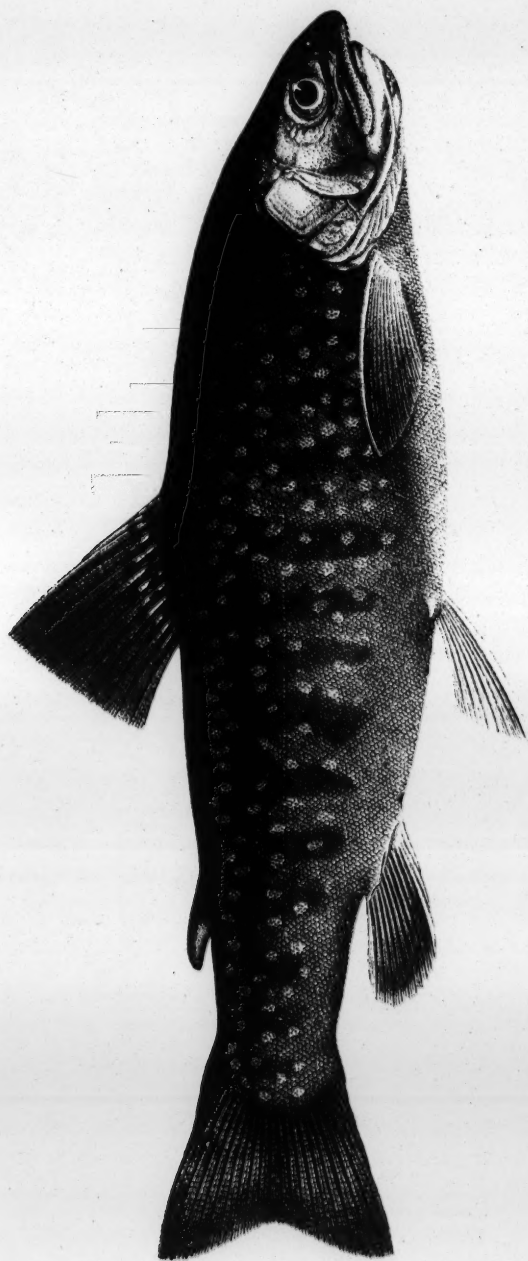


Harhart imp.

A Hammond del et lith.

*Male hybrid between SALMO LEVENENSIS, ♀ and S. FONTINALIS, ♂.*





A. Hammond del. et lith.

*Male hybrid between SALMO FONTINALIS ♀ and S. ALPINUS ♂.*

Harhart imp.

6. On Races and Hybrids among the Salmonidæ.—  
Part III. By FRANCIS DAY.

[Received November 24, 1884.]

(Plates LVI. & LVII.)

On May 20th I read a paper before this Society<sup>1</sup> wherein I detailed the results of some experiments made at Howietoun on the breeding and hybridization of the Salmonidæ. I now propose to continue their history up to the middle of November this year.

It will be remembered that in December 1880 some ova and milt were obtained from Salmon in the Teith, which were subsequently hatched at Howietoun, and in their early life were kept in the central wooden pond, from which they were transferred to pond no. 7<sup>2</sup>. During the month of May 1884 16 jumped out of the pond and were found dead, and in all their breeding-organs were observed becoming well developed.

On August 28th an examination was made of pond no. 7, and a grilse of 1½ lb. weight was removed. On being opened it proved to be a female with its ova well forward, the largest being 0·1 of an inch in diameter. The fish measured as follows:—

	inch.
Total length .....	14·1
Length of head .....	2·8
Length of pectoral fin .....	1·9
Length of caudal fin .....	2·2
Height of body .....	3·2
Eyes, diameter .....	0·55
Eyes from end of snout .....	0·8
Eyes, apart .....	1·1
Distance from snout to first } dorsal fin .....	5·7

112 rows of scales along the lateral line, 10 from the adipose dorsal fin downward and forwards to the lateral line; the rows of scales from the head to the base of the first dorsal fin irregular in their course. The longest outer caudal ray 2·2 inches, middle rays 1·0 inch; length of the base of the first dorsal fin 1·6 inch, interspace between it and the adipose fin 3·4 inches. Cæcal pylori 60, the longest 0·8 inch. *Colours*—two large black spots behind the eye, one on the upper portion of the preopercle and 2½ on the opercle; numerous black spots on the body above the lateral line, and anteriorly a few halfway down to the abdominal edge, and some in one line posteriorly. Dorsal fin grey with a lightish edge, and a

<sup>1</sup> See Proc. Zool. Soc. 1884, p. 376.

<sup>2</sup> See Proc. Zool. Soc. 1884, pp. 20, 21.

trace of an indistinct line of spots along its base. The other fins more or less lead-coloured with light edges.

On October 4th I received from Howietoun a grilse 13 inches long, which had either jumped out of the pond (no. 7) or been dragged out by vermin, and was dead when found. It was a female, with the eggs 0·2 of an inch in diameter, or double the size of those from the fish of August 28th. *Colours*—two irregular rows of black spots existed along the base of the dorsal fin. An injury close to the pectoral fin was present, as if the fish had been bitten by rats or injured by sea-gulls.

On November 7th a grilse  $1\frac{1}{4}$  lb. weight was found lying almost dead by the side of the pond; some (over 100) apparently ripe eggs were obtained from it, and the milt of a Lochleven Trout used to fertilize them.

Prior to giving an account of how we found the young *Salmo salar* going on, I should mention that pond no. 7, in which they were located, is lined with wood at the sides and bottom, is 100 feet long by 15 feet wide, 8 feet deep in the middle and  $6\frac{1}{2}$  at either end, inside measure, while the supply received is from half to one million gallons of water a day. Owing to the grilse constantly jumping at the sides, wire-netting to one foot in height was fixed around the edge of the upper half of the pond. About the middle of October fungus appeared among the fish, apparently due to injuries, as owing to the nature of the pond no suitable locality for depositing ova is present, and it seemed as if the females were constantly jumping in order to overcome obstructions<sup>1</sup>, and find a way to where they could construct their beds. Owing to this injuries are occasioned, and these seem sure to eventuate in fungus. The *Limnææ* thrive in this as well as in the other pond, but young Salmon do not seem to eat them, whereas Trout or Char at once devour them.

November 14th, pond no. 7 had the water let off<sup>2</sup>, as it required cleaning out and re-charring this year, the fish being in the mean time transferred to the brook-trout pond, which has just been re-done up, while its former inhabitants have been turned into the brook as being too old to be worth keeping; sixty-eight fish were transferred, the majority being males. These fish showed all the gradations of colouring, from the golden-banded parr to the silvery smolt wherein parr-bands were visible in certain lights, up to grilse which possessed milt or were distended with ova. Such examples as were in the parr-livery were males, but silvery smolts with parr-bands and also grilse had milt. Unfortunately the gravid females were to a great extent affected by fungus consequent on injuries; still one gave about two dozen eggs, which were milted from one of the males. Another week or even fortnight would have to elapse before it will be practicable to obtain eggs. Three which were too much injured to live,

<sup>1</sup> This phenomenon is not restricted to migratory forms, as species of many genera of the Carp family may be observed in Southern India or Sind springing in the same way at the impassable weirs which cross some of the rivers up which they ascend to breed.

<sup>2</sup> In the mud were many prides, *Petromyzon branchialis*.

were opened, and the ovaries were found quite distended with eggs,<sup>1</sup> almost ripe, but still just adherent. On looking at these fish in the water, some were seen to have black spots over the back as well as on the sides, but others had not. For the last three weeks these fish have been fed on young Lochleven Trout.

That Salmon may be reared in ponds, and in due time, if males, give milt, has been universally admitted, but many have denied that females can produce ova without first descending to the sea. Grilse are well known to breed earlier in the cold season than do mature Salmon; this it has been surmised must be owing to their being fish in which the time for propagating their species has been deferred for a season, or from February or March until the commencement of the following winter in October or November. Experiments at Howietoun have shown that from Salmon-eggs hatched in March 1881 most of the male parr had milt in November 1883; while two or three smolts which jumped out of the pond, and so met their deaths, had ova which in suitable places<sup>2</sup> would have matured that year. In 1884 all the females it appears would be ready to breed, but did they do so in rivers and had to depend on male Salmon for fecundating their ova, universal sterility would ensue, as the latter fish breed later on in the winter season. The parr of Salmon are not then normally ready for impregnating the ova of mature Salmon, or "to mingle with the river-trout" as Dr. Günther suggests, but are available to fertilize the ova of the grilse.

We may well ask the question whether it is a physiological necessity, as asserted by Rasch, for female smolts to descend to the salt water before grilse can develop eggs? This theory is held by some, and appears to be rather widely accepted. I have not considered it worth while to describe the grilse at Howietoun reared from Salmon-eggs, but have kept specimens for reference; consequently I am in a position to maintain that from the eggs of the Salmon, parr, smolts, and grilse with eggs have been reared in the Howietoun pond.

Of course the views I have held and still hold, that Salmon are marine forms which, in accordance with their anadromous instincts, come into our fresh waters to breed, as does the Shad, may or may not be correct. The reasons which have induced me to adopt these views I do not propose discussing in this paper; but I would point out that as the descent to the sea is not indispensable to the development of eggs, it therefore cannot be a physiological necessity, and perhaps we may class it among many other instances as "inherited instinct."

I have formerly shown that the milt of a young parr (hatched 1881 and milted in 1883) has insufficient vitality to properly fertilize

<sup>1</sup> I received the following telegram yesterday, Dec. 1st, 1884, from Howietoun:—"Two of the grilse spawned to-day, ova perfect; kept one female as evidence." This alludes to one being placed in spirit for future examination by anybody who may be dubious.

<sup>2</sup> Perhaps if these fish are kept another year in earth-ponds with a gravel water-course leading to them, more success will be obtained.

the ova of Trout, as the young suffered from dropsy, and on August 28th only about 100 (out of some thousands hatched in February 1884) were still alive. Many still moved about in the zig-zag manner of their younger days, and most appeared weakly; one, however, was 2 inches in length. Great care had been taken in feeding them, otherwise none would have remained, while in a state of nature such fish would soon have been destroyed. On November 14th these fish seemed to be doing well; one,  $2\frac{1}{2}$  inches long, is on the table; it has eleven parr-bands and several short intermediate ones, while it has only eleven rows of scales on a line from the adipose dorsal to the lateral line<sup>1</sup>.

So far I have shown that parr and smolts and grilse come from a common origin, that milt and ova may be present in them without their having gone to the sea; while the probable reason that the male parr has milt<sup>2</sup> at the early period of October or November is because it is at that time that the grilse deposits its ova<sup>3</sup>.

Should the milt of Salmon-parr be employed to fertilize Trout-eggs, what will be the result? These experiments at Howietoun, as I shall now show, have so far gone to demonstrate that the offspring are sterile.

November 25th, 1879, some eggs of the Lochleven Trout were fertilized from the milt of the Salmon, and up to this time all which have been observed have been sterile. I saw several on November 14th at Howietoun, pond no. 11, the largest being  $16\frac{1}{2}$  inches long, but all were sterile.

On August 26th, 1884, a hybrid  $6\frac{1}{2}$  inches in length was taken

<sup>1</sup> On April 30th, 1883, Mr. Douglas Ogilby captured a young Salmon in a lake which has no access to the sea. Its abdomen was so distended that he considered that it would have spawned within a few days, the more so because it was taken at the mouth of the only stream which enters the lake (Lough Ash, Co. Tyrone). The way in which the fish obtained access to this place was, that two years previously Mr. Ogilby took about 100 Sea-Trout and Salmon Smolts and turned them in. The lake is also curious in this respect, that in the dozens of other small lakes about these mountains, the Trout average about three to the lb., while here there are some of as much as 15 lb. weight. On April 24th, 1884, I examined this specimen (at Mr. Douglas Ogilby's request) at the Natural History Museum. It was a *Salmo salar* 14.5 inches long, with its abdomen much distended with ripe ova; these measured 0.25 of an inch in diameter, but they are compressed one against another forming lateral facets. There are 11 rows of scales between the adipose dorsal and lateral line, and 4 teeth on the front end or head of the vomer. Tail black. Did not examine pyloric cæca, as to do so injury must have been done to the ovisac.

<sup>2</sup> That milt of parrs will fertilize Salmon-ova, has been shown by Shaw, probably from such as are in their third season. Fertilizing Lochleven eggs with parr a year older than employed last year has been tried this season at Howietoun.

<sup>3</sup> The sea-trout ascend the streams near Stirling to breed at the same time as the grilse, but when I was at Howietoun the water-courses were rather full, owing to rains. However, on November 13th a frost set in, and keepers were sent to obtain some sea-trout for breeding-purposes, for with a frost the brooks &c. subside, because the rills and small affluents are frozen; from the same cause the temperature of water in the streams usually rises two or three degrees. Although two pairs of small sea-trout were observed at their redds the fishers failed in capturing them.

from the Octagon pond at Craigend. These fish were raised from the eggs of Lochleven Trout, fertilized by Salmon-milt December 24th, 1881, and hatched March 9th, 1882. The specimen was a barren female, the ovisac 1 inch long, and 0·15 of an inch wide and very thin. *Colours*—dorsal fin with 3 rows of black spots along its base. On November 14th, 1884, the pond was again drawn, but all the fish appeared to be sterile. One specimen, 10 inches long, was removed; it had 37 cæcal appendages, which were well loaded with fat; its colours were silvery with black spots, while the parr-bands were still visible: it was a sterile male. These fish have not shown the tendency to jump out of the pond as seen in the young Salmon, which at this age are fertile, as are also hybrids between Trout and Char, and hybrid Char a year younger. As all live at the same place, the supposition is raised that sterility is the rule in hybrids between Salmon and Trout, and if so, such must prevent the continuation of such races in rivers.

November 14th, 1884, about 12,000 Lochleven-Trout eggs were fecundated with the milt of three parrs and smolts, the smallest being 10 inches long, the middle-sized one 11, and the largest 12: the last had the parr-bands still visible. The eggs were placed in box no. 1 of the hatching-house. It will be interesting to ascertain if dropsies will occur, as they did last year when the male was a season younger; while it seems probable that Shaw's fish, ten inches long, which were successfully employed to fertilize Salmon-ova, must have been of the same age as these.

August 28th, 1884, a hybrid  $6\frac{1}{2}$  inches in length was removed from fish-culture pond no. 3 at Howietoun. This pond is 20 feet long by 5 wide, and contains about 36 inches of water; it is of the same size as pond no. 4. Of these fish about 190 existed at this date, and all were in excellent condition. They are the progeny of Lochleven-Trout eggs which were fertilized by the milt of the American Char, *Salmo fontinalis*, on November 15th, 1882. The appearance of these fish was most striking and due to their bands; the race for distinction's sake was named and will in future be termed the *Zebra*<sup>1</sup>, in order to distinguish them from the other hybrids (Plate LVI. figs. 1 & 2).

The following is a description of a specimen removed from the pond:—

B. x. D. 13 ( $\frac{3}{10}$ ). P. 13. V. 9. A.  $\frac{3}{8}$ . C. 19.

L. 1. 128. Cæc. pyl. 39, longest  $\frac{1}{2}$  inch.

	inches.
Total length .....	6·7
Length of head .....	1·5
Length of pectoral fin .....	1·0
Length of ventral fin .....	0·8
Length of caudal fin .....	1·0
Height of body .....	1·5
Eyes, diameter of .....	0·3

<sup>1</sup> See Proc. Zool. Soc. p. 376 ante.

	inches.
Eyes from end of snout .....	0·4
Eyes apart .....	1·5
Distance from snout to dorsal fin .....	2·8
Distance from base of pectoral to base of ventral fin. .	1·3
Distance from base of ventral to base of anal fin ....	1·2

**Teeth**—in a transverse row across the head of the vomer, followed by three more teeth placed in a single series along the anterior half of the body of that bone; this form of dentition being identical with what has been previously described in other specimens, and showing either that deciduous vomerine teeth may exist on the body of the vomer in Char crossed by Trout: or else, that instead of a double row of teeth along the body of the vomer, as seen in Trout, they may be reduced to a few placed in a single row should such fish be crossed with Char. **Scales**—22 rows pass from the base of the adipose dorsal downwards and forwards to the lateral line. **Colours**—yellowish shot with purple and reticulated with irregular black bands, spots, and markings along the body, but most spotted on the upper surface of the head and back; a few dark marks also on the sides of the head. Dorsal fin yellow, with black spots and irregular bands, the upper portion of its anterior edge being rather light with a dark base. Adipose dorsal with a black base and two black spots one above the other. Pectoral black-tipped. Anal with the three first rays white, posterior to which the fin is stained with dark grey, especially in its outer portion. Caudal dark-edged, and with a few indistinct bars at its base. On opening the specimen, it was found to be a male with the milt very fully developed.

November 12, 1884.—Pond no. 3 at Howietoun was examined, and the females of the Zebra race were not quite ready for breeding, while they appeared to be fewer in number than the males, some of which were ripe. A female Lochleven Trout furnished 1350 eggs, which were fertilized by the milt of one of the Zebras  $8\frac{1}{2}$  inches long, and placed in box 92 a. Should these eggs prove fertile the young will be three parts Lochleven to one part American Char.

August 28, 1882.—A hybrid  $7\frac{1}{2}$  inches long was taken from pond no. 4 at Howietoun from among about 90, all being in good condition. These fish are the progeny of an American Char milted from a Loch-Rannoch Char<sup>1</sup> November 15, 1882, and formerly termed *Salmo struanensis*, a dark variety of the common Char. These hybrids are now distinguished as the *Struan* breed. The following is a description of the specimen:—

B. xi. D. 13 ( $\frac{3}{10}$ ). P. 13. V. 8. A.  $\frac{3}{4}$ . C. 19. L. 1. 158.  
Cæc. pyl. 37.

	inches.
Total length .....	7·3
Length of head .....	1·5

<sup>1</sup> The three Loch-Rannoch Char died during this summer. It would appear that at Howietoun the American Char at five years old has ceased to be commercially paying as a breeder, while some even at four years old show signs of senility.

	inches.
Length of pectoral fin .....	1·2
Length of caudal .....	1·2
Length of ventral .....	0·9
Height of body .....	1·9
Eyes, diameter of .....	0·3
Eyes from end of snout .....	0·4
Eyes apart .....	0·5
Distance from snout to dorsal fin .....	3·0
Distance from pectoral to base of ventral .....	2·2
Distance from base of ventral to anal ....	1·4

The lower jaw slightly deformed, being unnaturally shortened. *Teeth*—in a transverse row across the head of the vomer, but more along the body of the bone. *Scales*—23 rows pass from the base of the adipose dorsal fin downwards and forwards to the lateral line. The dorsal, anal, and other fins are much more developed in these pure Char hybrids than in the Zebra, wherein the Char is crossed with a Trout. *Colours* of a beautiful iridescent purple, with 13 transverse or parr-bands along the sides; the whole of the body covered with small light spots, none on the fins. Anterior edge of the dorsal, ventral, and anal white, also the outer ray of the pectoral. A few dark marks along the base of the dorsal fin, all the fins darkest at their outer edges. On opening the specimen, it was found to be a male with the milt very fully developed (Plate LVII. figs. 1, 2).

November 12, 1884.—Pond no. 4 at Howietoun was again examined: the largest fish was  $8\frac{1}{2}$  inches long; most of the females were not quite ready for breeding.

A female of the Struan breed gave 146 eggs, and these were milted from a male of the same race; consequently, if fertile, will afford an instance of pure hybrid Char interbreeding. The diameter of the eggs averaged 0·13 of an inch; they were placed in box 92 b.

4500 eggs were taken from two Lochleven Trout and milted from a male of the Struan hybrid; if fertile, this will give a proportion of three parts Char to one part of Lochleven Trout. These were placed in box 88.

The eight hybrids, the progeny of the eggs of the American Char fecundated from a Lochleven Trout, are doing well, but are too few in number for a specimen to be yet taken. They much resemble the Zebra breed, and are termed the *Leopards*.

It will be as well to again allude more particularly to the very erroneous opinion which was given prominence to by Harmer, in a paper read before the Royal Society, May 28, 1767, who observed that "it appears that the size of the eggs is nearly the same in great and small fishes of the same species at the same time of the year," and which has continued to be almost universally believed in; for we still see Dr. Günther's statement (1880) respecting Teleostean fishes that "the ova of large and small individuals of the same species of course do not differ in size" is being referred to as

correct. The fish-culturist knows that larger eggs produce better fish, and larger eggs are generally, not invariably, the produce of older parents up to the acme of their prolificness.

I observed (P. Z. S. 1884, p. 28) how young hatched from larger eggs or those of older parents gave more quickly growing offspring; and this year a second experiment was made in the same two ponds. On August 27, 1884, I found the young fish of about the same size in both localities, which had been stocked this year with young Lochleven Trout bred from parents of the same age spawned the same day, and hatched in same room. On November 12, the two lots were still of about the same-sized fish. Near the ponds I observed a Kingfisher (*Alcedo ispida*) flying off with a young Trout; I mention this as the bird is rare in these parts.

The following are some of the measurements of fish-eggs made during November 1884, at Howietoun:—

<i>Salmo salar</i> , grilse 1½ lb. weight; diameter of each egg.....	0.21 of an inch.
" <i>fario</i> var. <i>levenensis</i> , 8 years old; diameter of each egg	0.20 "
" " " 7 " " "	0.19 "
" " " 6 " " "	0.19 "
" " " 6 " " "	0.18 "
" " " 3 " " "	0.17 "
" <i>fontinalis</i> ..... 4 " " "	0.18 "
" " 3 " " "	0.17 "
<i>Hybrid Char</i> ..... 2 " " "	0.13 "

It may not be amiss to here remark that not only is there a general increase in the size of the eggs of Salmonidæ with age, but also that there is a variation as to the size of the individual eggs in fishes. It is not infrequent to observe the first few eggs produced are what are known as "wind-eggs," being the empty shells of some from the preceding year; occasionally these are white and hard. Also there are sometimes very large wind-eggs which are passed as the last of the year's ova, such being apparently distended, and probably diseased forms, occasionally of very large size, and sometimes several having a membranous connection one with another and with the ovisac.

Eighty eggs of a Lochleven Trout were spawned direct into a glass tube on November 14, where they were kept in water for a week, at the end of which time 75 were 0.25 of an inch each in diameter, three were 0.20 of an inch, 1 was 0.75 of an inch, and one was 0.15 of an inch.

August 14, I received a brace of Brook-Trout (*Salmo fario*) from Mr. Arthur, of Otago, which were sent by S.S. 'Tongariro' in the refrigerating chamber, and which duly arrived in excellent condition.

Their dimensions were as follows:—

	Male 21 lb. weight.	Female 15 lb. weight.
	inches.	inches.
Total length .....	32.0	30.5
Length of head .....	8.0	6.0
Length of caudal fin .....	4.0	3.5
Height of body .....	8.5	8.0

Male 21 lb. weight. Female 15 lb. weight.

	inches.	inches.
Diameter of eye.....	0·9	0·8
Eye from end of snout .....	3·3	2·0
Eyes apart .....	2·6	2·0
Number of cæcal pylori.....	52	52

*Sexual differences.*—The male had the milt well developed; the knob on the lower jaw large, and on the mouth being closed it pressed against the palate. *Colours of male:* Generally of a blackish colour, with numerous small and oval spots, most distinct on the upper three fourths of the body, but some large ones along the abdomen; fins black. *Colours of female:* Spots larger than in the male and some appear to be red, dark along the back, but not so much so as the male; belly silvery. Eggs well developed, and average 0·2 of an inch in diameter. Mr. Arthur says that it is remarkable that the male, living in clear brilliant lake-water, was of a black colour: it was netted along with sixty more males and females of about similar dimensions. The outline of the back is "hog-backed" between the head and the dorsal fin, while the belly is very full, the tail slightly truncated, the other fins of the usual size, and the adipose very large. The longest pyloric cæca in each fish were 3 inches, the shortest 1 inch.

	Male.	Female.
Premaxillaries, extreme length of limb .....	2·0 inch.	1½ inch.
" number of teeth in each .....	9	6
" size of largest teeth .....	0·25 inch.	0·15 inch.
Maxilla, its extreme length .....	3·6	2·6
" its extreme width .....	0·5	0·25
" no. of teeth in each .....	21–24	13
" size of largest teeth .....	0·15 inch.	0·15 inch.
Mandible, no. of teeth each side .....	15	14
" size of largest teeth .....	0·25 inch.	0·17 inch.
Vomer, no. of teeth .....	2	0
Tongue, no. in each row .....	4	3

In the *male* there was as a rule a second or new tooth adherent to the gums along the inner side of each in the premaxillaries; the teeth in the maxillæ were irregularly placed, in more than one row in places, and with new ones in the gums. The two vomerine teeth were in a transverse row across the head of the bone; there were from 14 to 16 in each palatine. In the lower jaw the teeth were curved somewhat inwards, and the most posterior ones somewhat backward. The skin of the back was thickened and similar to what is generally perceived in old males in the breeding-season. Of course there are no means for ascertaining the precise age of these Trout; but the fact must not be overlooked that these fish are the progeny of eggs sent by Messrs. Buckland and Francis from Hampshire and Buckinghamshire streams, and which could not exceed fifteen years of age, while their appearance coincides with what would be termed *Salmo ferox* in Scotland or Ireland. I may here allude to the cæcal appendages, respecting the number of which as consti-

Fig. 1.



Head of male Otago Trout.

Fig. 2.

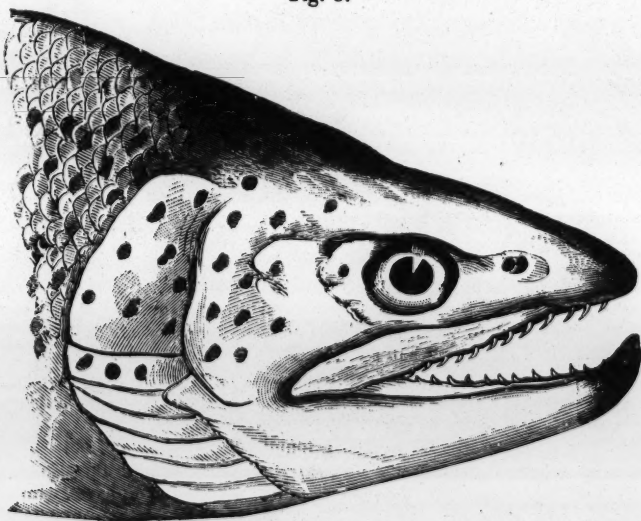


Head of female Otago Trout.

tuting species so much unnecessary discussion has arisen, and state that Mr. Arthur lately observed on the examination of 21 females and 7 males, that the females possessed from 33 to 61, with a mean of 47·3, and the males from 37 to 55, with a mean of 48·7. These two specimens each had 52. This is in fact a further corroboration, were any needed, that these appendages are not constant in number but variable.

In the *female* there were not so many young teeth coming forward as were seen in the male, while, if the figures of the two heads are compared, it will be seen that the length of the head in the male is elongated beyond what is perceived in the female, solely in the space anterior to the nostrils.

Fig. 3.



Head of Lochleven Trout.

This brings me to a short consideration of the hook on the lower jaw of male Trout; and as it has been so confidently stated by Dr. Günther of the Lochleven Trout, "Snout of moderate length, conical, not much produced in the male sex, in which a mandibular hook has never been observed" (Catal. Fish. vi. p. 101), I produce an example demonstrating this hook (see fig. 3), differing, it will be seen, from what occurs in the large Otago specimen, in that the hook is here in front of the upper jaw when the mouth is closed. The specimen was reared at Howietoun from eggs taken at Lochleven in 1878, and it had 69 cæcal appendages.

On November 14th I examined a male Lochleven ket, 20 inches in length, its head being 4·2 inches long, tail-fin 1·8 inch and rounded at its extremity, depth of body 4·2 inches; a considerable-sized knob on the end of the mandibles, which, when the mouth is closed, is outside the upper jaw but against which it rubs, and where it has formed a sore. The posterior edge of the orbit is exactly in the centre of the length of the head, while the length of the prenasal portion of the head equals  $1\frac{1}{2}$  the diameter of the eye, or is nearly similar to what obtains in the female Otago Trout. This instance is given as a typical form of the Lochleven Trout, while the heads of the Brook-Trout correspond with those of the Lochleven variety.

It appears to me probable that the sexual differentiation in the Trout is similar to what occurs in the Salmon, wherein in large examples the prenasal portion of the head equals the distance between the hind edge of the preopercle and the hind edge of the orbit. But as these proportions differ from what is seen in smaller, or rather perhaps one should say younger examples, the following may be pretty readily traced out in specimens.

After the second year, or when the fish commences breeding, a knob appears at the end of the lower jaw, which knob yearly increases in size at the breeding-season, until in 7-years-old fish (as at Howietoun) it is in advance of the upper jaw when the mouth is closed, often forming a sore surface in front of the premaxillaries. At such times the mandibles have increased in length proportionately more than the bones of the snout; thus the prenasal portion will only be found to be one half of the comparative length to what obtains in old fish, as seen in the Otago example. Here at Howietoun my observations had to be stopped, as fish over 7 or 8 years of age are not kept, being somewhat sterile. But it is clear that in the very large male specimen of which the head is figured the bones of the upper jaw have grown so that, instead of the knob on the mandibles being in advance of the upper jaw, it is inside the mouth.

In examining the Otago fish I found the mandibular hook half an inch long, extending not only on the upper surface, but also on the front and slightly on the inferior surface of the symphysis, while superiorly it becomes received into a large depression, situated between the ascending portions of the two premaxillaries, from the sheath of which it is divided by the mucous membrane of the mouth and soft lining of the palate. The two ascending portions of the premaxillaries are not fixed one to the other, but can move freely and be more or less easily separated; while the membrane which binds them down, although strong, is loose, permitting of considerable motion. Consequently the hook, although it may press against the palate, can do so without occasioning any injury, for the parts give way before it. But of course if any irritation occurs at this spot and ulceration supervenes, the hook<sup>1</sup> might pass through and appear on the upper surface of the head. When this takes place,

<sup>1</sup> Whether this hook ever falls off, or ulcerates off, or is partially or wholly absorbed after each breeding-season, I have no personal knowledge.





J. Smit lith.

OVIS OPHION.

Hanhart imp

movement in the upper jaw would be difficult or impossible, and the fish would die of starvation, and it seems to me that such is due to age as well as dependent on sex.

On August 26th went for a couple of hours fishing on Loch Goldenhorf, which had been stocked with Trout from Howietoun, and the fish are in their third year, and run up to one pound in weight. I examined the stomachs of two from among twenty-five we captured, both by their colouring showing unmistakable affinities to the Lochleven breed. In the first fish, of about  $\frac{3}{4}$  lb. weight, the stomach was thickened and resembled that of a gillaroo, but it had no entire shells inside it. The second, which was of similar size, on the contrary, had some entire shells of *Limnæa pyrifera*, not only in its stomach but also in the course of its intestines. It would thus appear that both forms had partaken of testaceous mollusks, but the one had the muscular coat of its stomach so developed as to be able to grind up the shells and so prevent their passing the pylorus, whereas in the other the shells were likewise swallowed but passed downwards along the intestinal canal, as may be seen in the marine Blennies and many other fishes.

#### EXPLANATION OF THE PLATES.

##### PLATE LVI.

Male hybrid between *Salmo levenensis*, ♀, and *S. fontinalis*, ♂.

Fig. 1. Side view.

Fig. 2. Dorsal aspect.

##### PLATE LVII.

Male hybrid between *Salmo fontinalis*, ♀, and *S. alpinus*, ♂.

Fig. 1. Side view.

Fig. 2. Dorsal aspect.

#### 7. On the Wild Sheep of Cyprus.

By Lt.-Col. J. BIDDULPH, F.Z.S.

[Received December 2, 1884.]

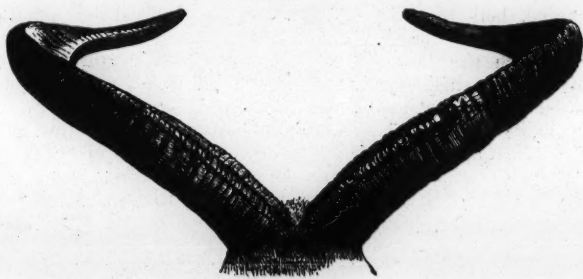
##### (Plate LVIII.)

I have brought here for inspection this evening a stuffed specimen of the Cyprian Wild Sheep, which has been sent to me by Sir Robert Biddulph, the High Commissioner of Cyprus, for presentation to the British Museum, where this species is at present not represented. The specimen is a male, and, judging by the marks which are generally supposed to indicate the annual growth of the horns, was apparently about eight years old when it was killed two months ago.

The Cyprian Mouflon is not found in all parts of the island, but is confined to the Troodos mountains in the western central portion,

where the highest point rises to 6590 feet above the sea-level. Here the Wild Sheep have a considerable area of pine-clad mountain to wander over, disturbed only by occasional wood-cutters and peasants herding goats and sheep. At the time of the first occupation

Fig. 1.

*Ovis ophion.*

Front view of horns.

Fig. 2.

*Ovis ophion.*

Side view of head with horns.

in 1878 it was supposed that the Wild Sheep had been exterminated with the exception of a single flock of twenty-five members, and a check was placed on their slaughter. Since then their numbers have increased and it may be hoped that under modified restrictions

Mouflon-stalking in Troodos may long continue to be one of the sports of Cyprus.

The earliest precise scientific mention of the Cyprus Mouflon as distinguished from the Corsican species is to be found in the 'Darstellung und Beschreibung der Thiere,' published in Berlin in 1829, by Messrs. Brandt and Ratzeburg, who class it with the Wild Sheep of Persia and Armenia under the name of *O. musimon* var. *orientalis*, to distinguish it from the Wild Sheep of Corsica and Sardinia, which they call *O. musimon* var. *occidentalis*. This work also contains a figure of a specimen from Cyprus, which was, and probably still is, in the Berlin Museum.

In 1840 the late Mr. E. Blyth read a paper on the Wild Sheep of the World before this Society, and gave the name of *O. ophion* to the Wild Sheep of Cyprus, and *O. gmelini* to the Wild Sheep of Armenia and Southern Persia. Mr. Blyth appears to have been struck by the close resemblance apparently existing between the Cyprus and Armenian species. In June 1875, in a paper on the Wild Sheep of Asia read before this Society by Sir Victor Brooke, it was suggested that the Cyprus Wild Sheep is nothing but an insular derivative of *O. gmelini*. In a paper on the Mammals of Asia Minor by Messrs. Alston and Darnford, read before this Society on February 3rd, 1880, attention was drawn to a specimen of *O. gmelini*, now in the British Museum, brought from the Cilician Taurus, which was shown to deviate from the accepted type of *O. gmelini* and to approximate to *O. ophion*. Nothing can be proved from comparison of the measurements of the horns of the two specimens of *O. ophion* now exhibited, one belonging to Lord Lilford, and of the head of *O. gmelini* mentioned in Messrs. Alston and Darnford's paper.

#### Measurements.

	A.	B.	C.	D.
	in.	in.	in.	in.
Length of horn along curve of fronto-nuchal edge .....	23.00	23.50	24.00	18.50
Circumference at base .....	7.40	8.15	8.00	8.60
Circumference at one half of length .....	6.60	7.45	7.50	6.30
Breadth of horns at widest portion .....	16.85	20.50	18.35	17.00
Distance from tip to tip .....	5.75	12.20	4.60	11.00

A. Stuffed specimen of *O. ophion* for British Museum.

B. Head of *O. ophion*, in collection of Colonel Biddulph.

C. Stuffed head of *O. ophion* in the collection of Lord Lilford.

D. Specimen of *O. gmelini* from Cilician Taurus, in British Museum.

The figure (P. Z. S. 1880, pp. 56, 57, figs. 3 and 6) shows that the general flexure of the horns is very similar to that of the Cyprus species. There appears, however, to be a considerable difference in the character of the horn. In *O. gmelini* the three edges of the horn are

well defined, so that if cut across a triangular section would be shown; in *O. ophion* the fronto-orbital edge is so rounded off as to be almost obliterated, the rugosities of the horn are not so well marked, and the entire horn is slenderer than in *O. gmelini*.

The present specimen of *Ovis ophion* (Plate LVIII.) may be described as follows:—

General colour rufous fawn above, white beneath, with an indistinct black line along the middle of the back for a short distance behind the withers, and a narrow blackish line along the sides, continued on the thighs, separating the red colour of the upper surface from the white of the belly; an indistinct saddle-patch on ribs formed by a few scattered white hairs. A broad black line down the centre of the breast, with a tendency to become a patch on the lower throat<sup>1</sup>. Front of fore legs above the knees blackish. Tail short, and black towards the tip. Dark patches inside the lower thighs just above the hocks. Ears small, and covered with very short grey hairs; inside white. Forehead, upper nose, and area in front of eyes dusky brown. Nose, chin, and throat white. Small suborbital pits. Height  $26\frac{1}{4}$  inches; age 7 or 8 years. Horns 23 inches measured along fronto-nuchal edge.

<sup>1</sup> In the specimen belonging to Lord Lilford the black hair on the lower throat is about two inches long. In this specimen it is no longer than the hair on the side of the neck. The difference may be seasonal or a mark of age.

# APPENDIX.

## LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

### DURING THE YEAR

1884.

- Jan. 1. 1 Crab-eating Opossum (*Didelphys cancrivora*). Presented by Miss Marie Adelaide Brassey.  
 1 White-fronted Capuchin Monkey (*Cebus albifrons*), ♀. Presented by Miss Muriel Agnes Brassey.  
 5 Knots (*Tringa canutus*). Purchased.  
 2. 1 Canadian Porcupine (*Erethizon dorsatus*). Presented by A. Gliddon, Esq., LL.D.  
 3. 1 Kinkajou (*Cercopithecus caudivolvulus*). Presented by Dr. Byres Moir.  
 4. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Madame Kettner.  
 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by G. Glynn Petre, Esq., F.Z.S.  
 1 Common Guillemot (*Lomvia troile*). Purchased.  
 5. 2 Gold Pheasants (*Thaumalea picta*), ♂ ♀. Deposited.  
 2 Common Peafowl (*Pavo cristatus*), ♂ ♀. Deposited.  
 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by G. Glynn Petre, Esq., F.Z.S.  
 8. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.  
 2 Bullfinches (*Pyrrhula europæa*), 2 ♀. Purchased.  
 10. 2 Great Kangaroos (*Macropus giganteus*), ♂ ♀. Presented by the Zoological and Acclimatization Society of Victoria.  
 11. 1 Dorsal Squirrel (*Sciurus hypopyrrhus*). Deposited.  
 12. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mr. C. L. Norman.  
 14. 1 Black-handed Spider Monkey (*Ateles geoffroyi*), ♀. Presented by Colin W. Scott, Esq.  
 15. 1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.  
 3 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.  
 16. 1 Babirussa (*Babirussa alfurus*), ♀. Born in the Menagerie. See P.Z.S. 1884, p. 55.  
 2 Yellow-bellied Liothrix (*Liothrix luteus*). Presented by Mrs. Edwards.

- Jan. 16. 1 Goldfinch (*Carduelis elegans*), ♂. Presented by Mrs. Edwards.
17. 1 Indian Elephant (mottled variety) (*Elephas indicus*), ♂. Deposited. See P. Z. S. 1884, p. 44.  
 1 Slow Loris (*Nycticebus tardigradus*). Deposited.  
 1 Grey Ichneumon (*Herpestes griseus*). Deposited.
18. 1 Brush Bronze-winged Pigeon (*Phaps elegans*). Presented by J. Charlton Parr, Esq.  
 1 Agile Wallaby (*Halmaturus agilis*). Purchased.
21. 1 Huanaco (*Lama huanacos*), ♀. Presented by J. W. Firth, Esq.  
 2 North-American Flying Squirrels (*Sciuropterus volucellus*), ♂ and ♀. Presented by F. S. Mosely, Esq., F.Z.S.  
 4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.  
 1 Great Grey Shrike (*Lanius excubitor*). Presented by Master Arthur Blyth.
22. 2 Bonnet-Monkeys (*Macacus sinicus*), ♂ and ♀. Presented by Mrs. St. John Michell.  
 3 Bonnet-Monkeys (*Macacus sinicus*), 1 ♂ and 2 ♀. Presented by Capt. Spencer Stanhope.  
 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Capt. Spencer Stanhope.  
 1 Arabian Baboon (*Cynocephalus hamadryas*), ♂. Presented by Capt. Spencer Stanhope.  
 4 Harvest-Mice (*Mus minutus*). Presented by G. T. Rope, Esq.  
 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by George Wood, Esq.
23. 1 Common Guillemot (*Lomvia troile*). Purchased.
25. 1 South-American Rat-Snake (*Spilotes variabilis*). Purchased.  
 6 Slender Ichneumon (*Herpestes gracilis*). Purchased.  
 1 Common Boa (*Boa constrictor*). Purchased.  
 1 Cheela Eagle (*Spilornis cheela*). Purchased.  
 1 Black Tanager (*Tachyphonus melaleucus*), ♂. Purchased.  
 1 White-throated Finch? (*Spermophila albogularis*), ♀. Purchased.  
 1 Tropical Seed-Finch (*Oryzoborus torridus*), ♀. Purchased.  
 2 Illiger's Macaws (*Ara maracana*). Purchased.  
 1 Cape Adder (*Vipera atropos*). Presented by E. Pillans, Esq.
26. 1 Indian Gazelle (*Gazella bennetti*), ♂. Presented by Capt. Spencer Stanhope.
28. 1 Quebec Marmot (*Arctomys monax*), ♀. Presented by G. S. White, Esq.  
 1 European Tree-Frog (*Hyla arborea*). Presented by the Rev. J. Stapledon Webber.  
 1 Fallow Deer (*Dama vulgaris*), ♀. Deposited.
29. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Deposited.  
 1 Long-eared Owl (*Asio otus*). Presented by Master O. Dallmeyer.  
 1 West-African Python (*Python sebae*). Presented by Capt. J. Grant Elliott.
30. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Harrison Brainthwaite, Esq., M.D.  
 1 Common Wolf (*Canis lupus*), ♂. Deposited.  
 7 Knots (*Tringa canutus*). Purchased.
31. 2 Spotted Hyænas (*Hycena crocuta*), ♂ and ♀. Purchased.

- Jan. 31. 1 Golden Eagle (*Aquila chrysaetos*). Purchased.  
 1 Tawny Eagle (*Aquila naevioides*). Purchased.  
 1 White-tailed Eagle (*Haliaeetus albicilla*). Purchased.  
 1 Cinereous Vulture (*Vultur monachus*). Purchased.  
 1 Temminck's Snapper (*Macroclommys temmincki*). Purchased.  
 1 Grey-cheeked Mangabey (*Cercocebus albigena*), ♀. Purchased.  
 1 Sykes's Monkey (*Cercopithecus albicularis*). Purchased.  
 1 African Cormorant (*Phalacrocorax africanus*). Purchased.  
 See P.Z. S. 1884, p. 55.  
 1 Red-vented Parrot (*Pionus menstruus*). Purchased.  
 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by E. F. Shortt, Esq.
- Feb. 1. 2 Chattering Lories (*Lorius garrulus*). Deposited.  
 2 Vieillot's Firebacks (*Euplocamus vieillotii*), ♂ and ♀. Deposited.  
 2. 1 Water-Rail (*Rallus aquaticus*). Presented by Mr. T. E. Gunn.  
 5 European Tree-Frogs (*Hyla arborea*). Presented by Miss E. Brunton.  
 4. 1 Common Hedgehog (*Erinaceus europæus*). Presented by A. Aitchison, Esq.  
 5. 1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by Col. Gildea.  
 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. J. M. Hagerman.  
 1 Black Kite (*Milvus migrans*). Presented by Mr. J. M. Hagerman.  
 2 Rose-ringed Parakeet (*Palæornis docilis*), ♀. Presented by Mrs. Newman.  
 6. 1 Pileated Sparrow-Hawk (*Accipiter pileatus*). Purchased.  
 1 Javan Maja-Finch (*Munia ferruginea*), ♂. Presented by Mr. Abrahams.  
 2 Collared Finches (*Spermophila collaria*), ♂ and ♀. Purchased.  
 1 Chanting Hawk (*Melierax musicus*). Purchased.  
 1 Partridge Bronze-winged Pigeon (*Geophaps scripta*). Purchased.  
 7. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by Capt. R. F. Slater.  
 8. 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.  
 9. 1 Bonnet-Monkey (*Macacus sinicus*). Presented by J. Wilson, Esq.  
 1 Acouchy (*Dasyprocta aconchy*). Purchased.  
 2 Common Jackdaws (*Corvus monedula*). Presented by Master Harcourt Hanrott.  
 11. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Furness.  
 1 Nose-crested Iguana (*Iguana rhinolophus*). Presented by Albert Vidler, Esq.  
 1 Banded Basilisk (*Basiliscus vittatus*). Presented by Albert Vidler, Esq.  
 12. 2 Prairie-Marmots (*Cynomys ludovicianus*). Deposited.  
 1 Naked-footed Owlet (*Athene noctua*). Presented by G. R. Lake, Esq.  
 14. 1 Red-eared Monkey (*Cercopithecus erythrotis*), ♀. Purchased.  
 See P.Z.S. 1884, p. 176.

- Feb. 14. 2 Slow Loris (*Nycticebus tardigradus*). Purchased.  
 1 Shaw's Gerbille (*Gerbillus shawii*), ♀. Presented by M. F. Lataste, C.M.Z.S.
15. 1 Red-eyed Ground-Finch (*Pipilo erythrophthalmus*), ♀. Purchased.  
 1 Eyebrowed Weaver-bird (*Hyphantornis superciliosus*). Purchased.  
 1 Military Macaw (*Ara militaris*). Deposited.
18. 4 Asiatic Quails (*Perdix asiatica*), 2 ♂ and 2 ♀. Purchased.  
 2 Iceland Falcons (*Hierofalco islandus*). Deposited.  
 1 Common Roe (*Capreolus caprea*), ♀. Presented by Charles Hambro, Esq.  
 1 Common Roe (*Capreolus caprea*), ♀. Presented by J. C. Mansel-Pleydell, Esq.
18. 1 Sambur Deer (*Cervus aristotelis*), ♂. Presented by James M'Gregor, Esq.  
 1 European Flamingo (*Phaenicopterus antiquorum*). Presented by James M'Gregor, Esq.
19. 1 Martin's Monkey (*Cercopithecus martini*), ♀. Purchased.  
 See P.Z.S. 1884, p. 176, pl. xiv.  
 1 Campbell's Monkey (*Cercopithecus campbelli*), ♀. Purchased.  
 1 Black-footed Penguin (*Spheniscus demersus*). Presented by F. Bloor, Esq.  
 3 White-crowned Pigeons (*Columba leucocephala*). Purchased.  
 1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Purchased.  
 1 Bearded Lizard (*Amphibolurus barbatus*). Purchased.  
 1 Pike (*Esox lucius*). Presented by C. Hoblyn, Esq., F.Z.S.  
 1 Philantomba Antelope (*Cephalophus maxwelli*). Born in the Menagerie.
20. 1 Bactrian Camel (*Camelus bactrianus*), ♂. Purchased.  
 1 Pine-Marten (*Mustela martes*). Presented by Edward de Stafford, Esq.  
 1 Greek Tortoise (*Testudo græca*). Presented by Miss M. L. Fergusson.
21. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Master A. J. Neill.
22. 1 Bonnet-Monkey (*Macacus indicus*), ♂. Presented by Mr. W. Graeme.  
 3 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.  
 1 Common Hare (*Lepus europæus*). Presented by Mr. George Pottier.  
 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by A. H. Lawder, Esq.  
 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Dr. Evans.
23. 1 Ruddy Ichneumon (*Herpestes smithi*), ♀. Purchased.  
 1 Maccarthy's Ichneumon (*Herpestes maccarthiæ*). Purchased.  
 See P.Z.S. 1884, p. 176.
25. 1 Grey Ichneumon (*Herpestes griseus*). Presented by J. B. Drew, Esq.  
 1 Ring-necked Parrakeet (*Pakeornis torquatus*), ♂. Presented by J. Biehl, Esq.  
 1 Cirl Bunting (*Emberiza cirrus*). Purchased.  
 8 Hoary Snakes (*Coronella cana*). Presented by C. B. Pillans, Esq.

- Feb. 25. 8 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
26. 1 Common Heron (*Ardea cinerea*). Purchased.  
 1 Black-headed Gull (*Larus ridibundus*). Presented by Miss Elise Cooper.  
 1 Common Tench (*Tinca vulgaris*). Presented by Mr. T. E. Gunn.
27. 3 Mute Swans (*Cygnus olor*). Received in Exchange.  
 1 Robben-Island Snake (*Coronella phocorum*). Presented by R. A. Robertson, Esq.
28. 1 Banded Parrakeet (*Palæornis fasciatus*), ♂. Purchased.
29. 1 Arabian Gazelle (*Gazella arabica*), ♀. Presented by Lieut. Brown, H.M.S. 'Malabar.'  
 2 Herring-Gulls (*Larus argentatus*). Presented by G. D. MacGregor, Esq.
- Mar. 4. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Deposited.  
 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.  
 1 Barn-Owl (*Strix flammea*). Presented by Mrs. W. Gittens.
5. 1 Bosman's Potto (*Perodicticus potto*). Purchased.  
 1 North-African Jackal (*Canis anthus*). Presented by F. L. Nind, Esq.  
 1 Zebu (*Bos indicus*), ♂. Born in the Menagerie.  
 1 Adorned Ceratophrys (*Ceratophrys ornata*). Purchased.
6. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by G. H. Lee, Esq.  
 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♀. Presented by G. H. Lee, Esq.  
 1 Yellow-billed Duck (*Anas xanthorhyncha*), ♂. Received in Exchange.
7. 1 Bengalese Cat (*Felis bengalensis*), ♂. Purchased.  
 2 Herring-Gulls (*Larus argentatus*). Presented by Mrs. Fridrich.  
 4 Allen's Porphyrios (*Hydronia alleni*). Presented by Lord Lilford, F.Z.S.
8. 4 Blue Titmice (*Parus cæruleus*). Presented by Mr. Hanauer.  
 1 Kagu (*Rhinocetus jubatus*). Received in Exchange.  
 2 Emus (*Dromæus novæ-hollandiæ*). Hatched in the Gardens.
10. 1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.
11. 2 Mute Swans (*Cygnus olor*). Purchased.
12. 1  $\frac{1}{2}$ -bred American Bison (bred between *Bison americanus*, ♂, and a female bred between a male *Bison americanus* and a female hybrid between *Bos frontalis* and *Bos indicus*), ♀. Born in the Menagerie. See P.Z.S. 1884, p. 399, pls. xxxiv. & xxxv.  
 1 Squirrel Monkey (*Chrysothrix sciurea*). Presented by Mrs. Dundas.  
 1 West-India Rail (*Aramides cayennensis*). Presented by Mrs. E. Hairby.
13. 1 Leopard (*Felis pardalis*), jr. ♂. Presented by S. Cresswell.  
 1 Kestrel (*Tinnunculus alaudarius*). Presented by F. E. Baum, Esq.  
 4 Redshanks (*Totanus calidris*). Purchased.
17. 1 Arabian Baboon (*Cynocephalus hamadryas*), ♀. Presented by J. B. Netherwood, Esq.

- Mar. 19. 5 Rufus (*Machetes pugnax*). Purchased.
20. 1 Weeper Capuchin (*Cebus capucinus*), ♂. Purchased.  
 7 Black-eared Marmosets (*Hapale penicillata*). Purchased.  
 9 Lined Finches (*Spermophila lineola*). Purchased.  
 1 Yellow Hangnest (*Cassicus persicus*). Purchased.  
 2 Blue-fronted Amazons (*Chrysotis aestiva*). Purchased.
21. 1 Common Buzzard (*Buteo vulgaris*). Presented by H. Bamford, Esq.  
 1 Peregrine Falcon (*Falco peregrinus*). Presented by H. Bamford, Esq.  
 4 Crested Pigeons (*Ocyphaps lophotes*). Purchased.  
 3 Hardwicke's Mastigures (*Uromastix hardwicki*). Purchased.  
 1 Common Rattlesnake (*Crotalus durissus*). Purchased.
22. 2 Clapperton's Francolins (*Francolinus clappertoni*), ♂ and ♀. Presented by Thos. Thornton, Esq.
23. 1 Black Lemur (*Lemur macaco*). Born in the Gardens.
24. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by G. A. Zobel, Esq.  
 1 Leopard Tortoise (*Testudo pardalis*). Purchased.  
 1 Egyptian Cobra (*Naia haje*). Purchased.  
 1 Smooth Snake (*Coronella levis*). Presented by W. H. B. Pain, Esq.
25. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Mr. G. Somerford.  
 1 Grecian Ibex (*Capra agagrus*), ♂. From Crete. Presented by Thos. B. Sandwith, Esq.  
 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.  
 3 Herring-Gulls (*Larus argentatus*). Presented by S. Aloof, Esq.
26. 1 Axis Deer (*Cervus axis*), ♀. Presented by L. B. Lewis, Esq.  
 1 Rose-coloured Pastor (*Pastor roseus*). Deposited.  
 1 Rose-crested Cockatoo (*Cacatua moluccensis*). Presented by General Rundall, R.E.
28. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
29. 1 Bosman's Potto (*Perodicticus potto*). Presented by Capt. Grant Elliott.
30. 1 White-fronted Lemur (*Lemur albifrons*). Born in the Menagerie.  
 1 Common Squirrel (*Sciurus vulgaris*). Presented by P. A. Halst, Esq.
31. 1 Geoffroy's Dove (*Peristera geoffroyi*), ♂. Received in Exchange.
- April 2. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. F. Mortimer.  
 2 Common Peafowl (*Pavo cristatus*), ♂ and ♀. Presented by R. F. J. Cobbett Allen, Esq.  
 3. 1 Yaguarundi Cat (*Felis yaguarundi*). Purchased.  
 1 Lühndorf's Deer (*Cervus luehdorfi*), ♂. Purchased.  
 7 Waxwings (*Ampelis garrulus*). Purchased.  
 2 Jardine's Parrots (*Psephenophus guillemi*). Purchased.  
 2 Proteus (*Proteus anguinus*). Purchased.
4. 3 Rhinoceros Hornbills (*Buceros rhinoceros*), 1 ♂ and 2 ♀. Purchased.  
 2 Nepalese Hornbills (*Aceros nepalensis*), ♂ and ♀. Purchased.  
 See P.Z.S. 1884, p. 251.

- April 4. 1 Green Cochoa (*Cochoa viridis*). Purchased.  
 2 Nepal Tree-Pies (*Dendrocitta nepalensis*). Purchased.  
 1 Grey-headed Thrush (*Turdus castaneus*). Purchased.  
 3 Bronze Fruit-Pigeons (*Carpophaga aenea*). Purchased.  
 2 White-backed Pigeons (*Columba leuconota*). Purchased.  
 2 White-breasted Gallinules (*Gallinula phaeicura*). Presented by Mr. W. Jamrach.  
 2 Secretary Vultures (*Serpentarius reptilivorus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 1 Lucian's Parakeet (*Palæornis luciani*). Received in Exchange.  
 5. 1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by H. W. Kingdom, Esq.  
 1 Common Viper, black variety (*Vipera berus*). Presented by Lord Londesborough, F.Z.S.  
 7. 1 Blau-bok Antelope (*Cephalopus pygmaeus*). Presented by Mrs. Wilson.  
 1 Smooth Snake (*Coronella laevis*). Presented by W. H. B. Pain, Esq.  
 1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.  
 1 Common Snake (*Tropidonotus natrix*). Presented by W. H. B. Pain, Esq.  
 1 Slow-worm (*Anguis fragilis*). Presented by W. H. B. Pain, Esq.  
 9. 1 Pig-tailed Monkey (*Macacus nemestrinus*). Presented by Dr. Benthal.  
 1 Weeper Capuchin (*Cebus capucianus*), ♀. Presented by Miss Vincent.  
 3 Common Vipers (*Vipera berus*). Purchased.  
 10. 6 Long-fronted Gerbilles (*Gerbillus longifrons*). Bred in the Gardens.  
 11. 1 Moose (*Alces machlis*), ♂. From Canada. Purchased.  
 1 Short-eared Owl (*Asio brachyotus*). Presented by O. Burrows, Esq.  
 1 Chinese White-eye (*Zosterops simplex*). Presented by Mr. J. Abrahams.  
 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Mr. A. Begg.  
 1 Alligator (*Alligator mississippiensis*). Presented by Mr. A. Begg.  
 12. 2 Mute Swans (*Cygnus olor*), ♂ ♀. Purchased.  
 16. 1 Burchell's Zebra (*Equus burchelli*), ♀. Deposited.  
 17. 3 Michie's Tufted Deer (*Elaphodus michianus*), 1 ♂, 2 ♀. Deposited.  
 4 Darwin's Pucras Pheasants (*Pucrasia darwini*), 3 ♂, 1 ♀. Deposited.  
 1 Elliot's Pheasant (*Phasianus ellioti*), ♂. Deposited.  
 1 Central-American Agouti (*Dasyprocta isthmica*). Presented by Hugh Wilson, Esq.  
 1 Herring-Gull (*Larus argentatus*). Presented by Thos. Daws, Esq.  
 18. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by E. Drew, Esq.  
 1 Ludio Monkey (*Cercopithecus ludio*), ♀. Presented by F. W. Robinson, Esq.  
 1 Common Viper (*Vipera berus*). Presented by H. German, Esq.

- Apr. 19. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by C. J. Martin, Esq.  
 3 Corn-Buntings (*Emberiza miliaria*). Purchased.
21. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by A. McDonnett Green, Esq.  
 1 Diana Monkey (*Cercopithecus diana*), ♀. Deposited.
22. 1 Common Fox (*Canis vulpes*). Presented by Miss Bertha Haig.  
 1 Dusky Parrot (*Pionus violaceus*). Received in Exchange.  
 1 Jerdon's Ichneumon (*Herpestes jerdoni*). Purchased.  
 1 Snake (*Homalocranion*, sp. inc.). Purchased.  
 1 American Bunting (*Euspiza americana*). Purchased.  
 1 Smooth-headed Oapuchin (*Cebus monachus*), ♂. Purchased.  
 2 Schlegel's Doves (*Chalcopelia puella*). Purchased.  
 1 Severe Macaw (*Ara severa*). Purchased.  
 1 Diademed Amazon (*Chrysotis diademata*). Purchased.  
 1 Banded Aracari (*Pteroglossus torquatus*). Purchased.  
 1 Yellow-shouldered Amazon (*Chrysotis ochroptera*). Purchased.
- 1 Buffon's Touracou (*Corythaix buffoni*). Purchased.
23. 1 Gigantic Salamander (*Megalobatrachus maximus*). Purchased.  
 See P. Z. S. 1884, p. 251.
24. 3 Russell's Vipers (*Vipera russelli*). Presented by Gerald Waller, Esq.  
 2 Indian Bat-Snakes (*Ptyas mucosa*). Presented by Gerald Waller, Esq.
25. 1 Herring-Gull (*Larus argentatus*). Presented by R. Morton Middleton, jun., Esq.  
 1 Green Lizard (*Lacerta viridis*). Presented by J. H. Leech, Esq.  
 1 Anaconda (*Eunectes murinus*). Purchased.
26. 1 Grey Ichneumon (*Herpestes griseus*), ♂. Deposited.  
 1 Short-headed Phalanger (*Echidna breviceps*). Deposited.  
 3 Lesser Birds of Paradise (*Paradisaea minor*), 3 ♂. Presented by C. T. Kettlewell, Esq., F.Z.S. From the island of Jobie, New Guinea. See P. Z. S. 1884, p. 251.  
 1 Chattering Lory (*Lorius garrulus*). Deposited.  
 1 Three-coloured Lory (*Lorius tricolor*). Deposited.  
 2 Triton Cockatoos (*Cacatua triton*). Deposited.  
 1 Red-vented Cockatoo (*Cacatua philippinarum*). From the Sooloo Islands. Deposited. See P. Z. S. 1884, p. 251.  
 2 Red-sided Eclectus (*Eclectus pectoralis*). Deposited.  
 1 Blue-breasted Lory (*Eos indica*). Deposited.  
 1 Mediterranean Seal (*Monachus albiventer*). Purchased. See P. Z. S. 1884, p. 251.  
 2 Chinchillas (*Chinchilla lanigera*), 2 ♂. Presented by C. Cumberland, Esq., F.Z.S.
28. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss Harbord.  
 2 Clapperton's Francolins (*Francolinus clappertoni*). Presented by Major H. Wade Walton.  
 2 Axolotls, white variety (*Siredon mexicanus*). Purchased.
30. 1 Maholi Galago (*Galago maholi*). Born in the Menagerie.  
 1 Spotted Ichneumon (*Herpestes nepalensis*), ♀. Presented by Mr. John Walker.  
 2 Wattled Cranes (*Grus carunculata*). Purchased.  
 2 Spur-winged Geese (*Plectropterus gambensis*). Purchased.  
 4 Vinaceous Turtle-Doves (*Turtur vinaceus*). Purchased.

- Apr. 30. 3 Harlequin Quails (*Coturnix histrionica*), 2 ♂ and 1 ♀.  
Purchased.
- 2 Barn-Owls (*Strix flammea*). Presented by H. Church, Esq.
- 1 Banded Gymnogene (*Polyborides typicus*). Purchased. See P. Z. S. 1884, p. 251.
- 2 Yucatan Blue Jays (*Cyanocitta yucatanica*). Purchased.
- May 1. 9 Coypus (*Myopotamus coypus*). Born in the Menagerie.
- 1 Dow's Tapir (*Tapirus dowi*). From Venezuela, ♂. Presented by Reginald Pringle, Esq.
- 1 Crab-eating Opossum (*Didelphys cancrivorus*). Received in Exchange.
- 1 Spiny Tree-Porcupine (*Sphingurus spinosus*), ♀. Received in Exchange. See P. Z. S. 1884, p. 389, pl. xxxiii.
- 1 Moustache Monkey (*Cercopithecus cephus*). Received in Exchange.
- 2 White Cranes (*Grus leucogeranus*). Purchased.
- 1 Herring-Gull (*Larus argentatus*). Presented by Miss Laura Dunnage.
- 1 Grey-cheeked Mangabey (*Cercocebus albigena*), ♂. Purchased.
- 2 Pig-tailed Monkeys (*Macacus nemestrinus*, ♂ and ♀. Presented by Miss Ethel Fenwick. From Borneo.
- 2 Hoary Snakes (*Coronella cana*). Presented by E. Watson, Esq.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by F. Harrison, Esq.
- 1 Garnett's Galago (*Galago garnetti*), ♂. Presented by Lieut. James Knowles, R.N.
- 1 Cabot's Horned Tragopan (*Cerionis caboti*), ♂. Purchased.
- 3 Chukar Partridges (*Cacabis chukar*), 1 ♂ and 2 ♀. Presented by Lieut.-Col. C. Swinhoe.
5. 2 Tigrine Turtle-Doves (*Turtur tigrinus*). Purchased.
- 8 Edible Frogs (*Rana esculenta*). Purchased.
- 2 Marbled Newts (*Molge marmorata*). Purchased.
- 10 Branched Sea-Horses (*Hippocampus ramulosus*). Purchased.
6. 1 Raccoon, white variety (*Procyon lotor*). Presented by F. J. Thompson, Esq.
- 2 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Gardens.
- 2 Alligators (*Alligator mississippiensis*). Presented by Mrs. Andrade.
7. 2 Common Crowned Pigeons (*Goura coronata*). Purchased.
- 1 Gold Pheasant (*Thaumalea picta*), ♀. Presented by F. Reed, Esq.
8. 2 Peregrine Falcons (*Falco peregrinus*). Presented by Lieut.-Col. Drummond Moray.
- 2 Japanese Greenfinches (*Ligurinus sinicus*), ♂ and ♀. Purchased.
- 21 River Lampreys (*Petromyzon fluviatilis*). Presented by Mr. T. E. Gunn.
9. 1 Barbary Ape (*Macacus inuus*). Presented by the Countess of Craven.
- 1 Canadian Porcupine (*Erethizon dorsatus*). Born in the Menagerie.
- 1 Mouflon (*Ovis musimon*), ♂. Presented by Col. Knox, C.B., and the Officers 1st Battalion Scots Guards.

- May 9. 1 Ground-Hornbill (*Bucorvus abyssinicus*). Presented by Capt. Rupert L. Lonsdale.
10. 1 Nightingale (*Daulias lusciniæ*), ♂. Purchased.  
5 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
11. 1 European Tree-Frog (*Hyla arborea*). Presented by G. W. Obicini, Esq., F.Z.S.
12. 1 Hodgson's Partridge (*Perdix hodgsoniæ*). Presented by Mr. W. Jamrach.  
1 Slow-worm (*Anguis fragilis*). Presented by Master Conrad Hanrott.
13. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by N. King, Esq.  
1 Gayal (*Bibos frontalis*), ♀. Born in the Menagerie.  
2 Japanese Pheasants (*Phasianus versicolor*), ♂ and ♀. Purchased.  
2 Egyptian Geese (*Chenalopex ægyptiaca*). Purchased.  
1 White American Crane (*Grus americana*). Purchased.  
1 Asp Viper (*Vipera aspis*). Purchased.  
13 Green Lizards (*Lacerta viridis*). Purchased.  
2 Common Vipers (*Vipera berus*). Presented by W. H. B. Pain, Esq.
14. 1 Partridge (*Perdix cinerea*). Presented by Robert Steel, Esq.
15. 1 Banded Ichneumon (*Herpestes fasciatus*). Presented by Master W. T. Adams.  
1 Bernicle Goose (*Bernicla leucopsis*). Received in Exchange.  
3 Variegated Sheldrakes (*Tadorna variegata*), 1 ♂ and 2 ♀. Received in Exchange.
16. 3 Canadian Beavers (*Castor canadensis*). Born in the Menagerie.  
1 Pigmy Hog (*Porcula salvania*), ♀. Born in the Menagerie.
17. 1 Quail (*Coturnix communis*), ♀. Purchased.  
9 Variegated Sheldrakes (*Tadorna variegata*), 6 ♂ and 3 ♀. From New Zealand. Received in Exchange.  
4 Soft-billed Ducks (*Hymenolæmus malacorhynchus*). From New Zealand. Received in Exchange. See P. Z. S. 1884, p. 389.  
1 Argentine Tortoise (*Testudo argentina*). Presented by Mr. W. Petty.
19. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. Keith Fraser.  
1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by J. L. Ellis, Esq.  
1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Received in Exchange.
20. 1 Rabbit-eared Perameles (*Perameles lagotis*), ♀. Purchased.  
2 Specious Pigeons (*Columba speciosa*). Purchased.  
1 Herring-Gull (*Larus argentatus*). Presented by E. H. Cree, Esq., M.D.
21. 1 Wapiti Deer (*Cervus canadensis*), ♂. Born in the Menagerie.  
1 Nicobar Pigeon (*Calenas nicobarica*). Presented by Thos. H. Haynes, Esq.
22. 1 Black-backed Jackal (*Canis mesomelas*), ♂. Presented by H. P. Plummer, Esq.
23. 2 Red-throated Francolins (*Francolinus rubricollis*). Presented by E. Lort Phillips, Esq., F.Z.S. From Somali-land. See P. Z. S. 1884, p. 389.

- May 23. 2 Kirk's Francolins (*Francolinus kirki*). From Somali-land. Presented by E. Lort Phillips, Esq., F.Z.S. See P. Z. S. 1884, p. 389.
24. 1 Long-eared Owl (*Asio otus*). Presented by Mr. T. E. Gunn.  
1 Spotted Eagle-Owl (*Bubo maculosus*). Presented by Capt. Lerner.
26. 1 Bosman's Potto (*Perodicticus potto*), ♂. Purchased.  
1 Duyker-bok (*Cephalophus bergensi*), ♀. Purchased.  
2 Blood-stained Finches (*Carpodacus hæmorrhous*), ♂ and ♀. Purchased.  
1 Snow-Bunting (*Plectrophanes nivalis*). Purchased.  
1 Angolan Vulture (*Gypohierax angolensis*). Purchased.  
1 Annulated Snake (*Leptodira annulata*). Purchased.  
1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Purchased.  
1 Himalayan Bear (*Ursus tibetanus*). Presented by Lieut. E. A. P. Hobday.  
1 Ring-tailed Coati (*Nasua rufa*). Purchased.
27. 1 Scapulated Fruit-Bat (*Pteropus scapulatus*). From Thursday Island. Purchased.  
1 Leach's Laughing Kingfisher (*Dacelo leachi*). Presented by Dr. Carl Lumboltz.  
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by E. R. Oliver, Esq.  
1 Montagu's Harrier (*Circus cineraceus*). Deposited.  
1 Emperor Boa (*Boa imperator*). Deposited.  
4 River-Frogs (*Rana fortis*). From Germany. Presented by G. A. Boulenger, Esq., F.Z.S.
28. 1 Common Wombat (*Phascolomys wombat*, var. *nigra*). Received in Exchange.  
1 Guatemalan Amazon (*Chrysotis guatemalæ*). Purchased.  
1 Crab-eating Opossum (*Didelphys cancrivora*). Purchased.  
2 Call Ducks (*Anas boscas*, var.), ♂ and ♀. Purchased.  
1 Wild Duck (*Anas boscas*), ♂. Purchased.  
2 Common Wigeon (*Mareca penelope*), ♂ and ♀. Purchased.  
2 Common Pintails (*Dafila acuta*), ♂ and ♀. Purchased.  
6 Common Teal (*Querquedula crecca*), 2 ♂ and 4 ♀. Purchased.  
2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Purchased.  
2 Muscovy Ducks (*Cairina moschata*), ♂ and ♀. Purchased.
29. 4 Elegant Grass-Parrakeets (*Euphema elegans*), 2 ♂ and 2 ♀. Purchased.  
1 Great Grey Shrike (*Lanius excubitor*). Presented by J. Pratt, Esq., F.Z.S. From Cambridgeshire.  
3 Black-eared Marmosets (*Hapale penicillata*), 3 ♂. Presented by H. F. Makins, Esq., F.Z.S.  
1 Spotted Bower-bird (*Chalymodera maculata*). Presented by Lieut.-Col. W. Hill James.  
1 Green Turtle (*Chelone viridis*). Presented by J. Wyan Thomas, Esq.
30. 2 Violet Tanagers (*Euphonia violacea*). Presented by Dr. Llewellyn A. Morgan.  
1 Common Wild Duck (*Anas boscas*), ♀. Purchased.  
1 Common Boa (*Boa constrictor*). Deposited.
31. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*), ♀. Presented by J. W. Dring, Esq.  
1 Common Otter (*Lutra vulgaris*). Presented by Messrs. Chas. Early & Co.  
1 Heron (*Ardea cinerea*). Presented by Mr. T. E. Gunn.

- June 2. 1 Burchell's Zebra (*Equus burchelli*), ♀. Deposited.  
 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.  
 5 Horned Lizards (*Phrynosoma cornutum*). Deposited.
4. 1 Mexican Deer (*Carriacus mexicanus*), ♀. Born in the Menagerie.  
 2 Sociable Vultures (*Vultur auricularis*). Presented by Sir Donald Currie, K.C.M.G.  
 1 Egyptian Vulture (*Neophron percnopterus*). Presented by Sir Donald Currie, K.C.M.G.
5. 2 Squirrel Monkeys (*Chrysothrix sciurea*), ♂ and ♀. Presented by Robt. Thom, Esq.  
 5 Golden-eyes (*Clangula glaucion*). Purchased.  
 1 Long-fronted Gerbille (*Gerbillus longifrons*). Born in the Menagerie.  
 1 Grey Amphibæna (*Blanus cinereus*). From Portugal. Presented by W. O. Tait, Esq., C.M.Z.S.
6. 2 Black-eared Marmosets (*Hapale penicillata*), ♂. Presented by C. D. Middleton, Esq.  
 2 Common Camels (*Camelus dromedarius*). Presented by J. T. St. Aubyn, Esq., Grenadier Guards. From Tokar, Eastern Soudan.  
 5 Common Snakes (*Tropidonotus natrix*). Purchased.  
 3 Asp Vipers (*Vipera aspis*). Purchased.  
 24 Green Lizards (*Lacerta viridis*). Purchased.
7. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Mrs. Grover.  
 1 Marsh-Ichneumon (*Herpestes galera*). Presented by Dr. Holub, C.M.Z.S.  
 1 Dusky Ichneumon (*Herpestes pulverulentus*). Presented by Dr. Holub, C.M.Z.S.  
 1 Papuan Pig (*Sus papuensis*). Deposited.
9. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.  
 6 Chiloe Wigeon (*Marca chiloensis*). Bred in the Gardens.  
 1 Angulated Tortoise (*Chersina angulata*). Presented by F. R. Hemming, Esq. From North Damara Land.  
 1 Royal Python (*Python regius*). Deposited.
10. 1 Echidna (*Echidna hystrix*). Purchased.  
 1 Brush-Turkey (*Talegalla lathami*), ♀. Purchased.  
 1 Angulated Tortoise (*Chersina angulata*). Presented by F. R. Hemming, Esq. From North Damara Land.
11. 4 Chinese Blue Magpies (*Cyanopoliis cyanus*). Bred in the Gardens.  
 4 Royal Pythons (*Python regius*). Deposited.
12. 2 Black-eared Marmosets (*Hapale penicillata*), 2 ♂. Presented by J. H. Bentley, Esq.  
 1 Marsh-Ichneumon (*Herpestes galera*). Presented by Mrs. Frank.  
 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by Mr. McClellan.  
 2 Red-cheeked Colies (*Colius erythromelon*). Purchased. See P. Z. S. 1884, p. 475, pl. xlv.  
 4 Bronze-winged Pigeons (*Phaps chalcoptera*), 2 ♂ and 2 ♀. Purchased.  
 1 Great-billed Parrakeet (*Tanygnathus megalorhynchus*). Purchased.
13. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Deposited.  
 1 Kingfisher (*Alcedo ispida*). Purchased.

- June 13. 2 Angolan Vultures (*Gypohierax angolensis*). Presented by Thos. J. Allridge, Esq.
- 1 White-necked Stork (*Dissura episcopus*). Presented by Thos. J. Allridge, Esq.
- 1 African Tantalus (*Pseudotantalus ibis*). Presented by Thos. J. Allridge, Esq.
- 1 Spur-winged Goose (*Plectropterus gambensis*). Presented by J. B. Elliott, Esq.
- 4 Muscovy Ducks (*Cairina moschata*). Deposited.
- 1 Mealy Amazon (*Chrysotis farinosa*). Purchased.
- 2 Mute Swans (*Cygnus olor*), ♂ and ♀. Presented by H. Welch Thornton, Esq.
14. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by J. Bulteel, Esq.
- 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by the Committee of the Latimer-Road Mission.
- 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Committee of the Latimer-Road Mission.
- 1 Lion (*Felis leo*), ♂. Born in the Menagerie.
- 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
- 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by T. Jay, Esq.
- 4 White Storks (*Ciconia alba*). Purchased.
- 1 Slow-worm (*Anguis fragilis*). Presented by Mr. T. E. Gunn.
- 1 Common Viper (*Vipera berus*). Presented by Mr. T. E. Gunn.
16. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mde. Kettner.
- 1 Common Boa (*Boa constrictor*). Purchased.
17. 2 White-fronted Capuchins (*Cebus albifrons*), ♂ and ♀. Presented by Mr. Messum.
- 1 Harpy Eagle (*Thrasaetus harpyia*). Presented by Capt. H. King. From Bogota.
- 1 Red-billed Whistling Duck (*Dendrocygna autumnalis*). Presented by Capt. H. King.
- 1 White-tailed Buzzard (*Buteo albicaudatus*). Presented by Mr. Lewis.
- 1 Blue-and-Yellow Macaw (*Ara ararauna*). Deposited.
- 3 European Pond-Tortoises (*Emys europæa*). Purchased.
- 6 Asp Vipers (*Vipera aspis*). Purchased.
18. 1 Wedge-tailed Eagle (*Aquila audax*). Presented by H. Ling Roth, Esq.
- 4 White Storks (*Ciconia alba*). Purchased.
19. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♀. Purchased.
- 1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Presented by Mrs. Moore.
- 2 Choughs (*Pyrrhocorax graculus*). Presented by J. Compton Lees, Esq.
- 2 Cape Crowned Cranes (*Balearica chrysopelargus*). Presented by J. R. Chapman, Esq.
- 1 Black-necked Swan (*Cygnus nigricollis*), ♂. Received in Exchange.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Howard Lane, Esq.
- 1 Common Squirrel (*Sciurus vulgaris*). Purchased.

- June 20. 1 Coypu (*Myopotamus coypus*), ♀. Presented by Mrs. Constance Kelly.
21. 1 White Stork (*Ciconia alba*). Presented by Hubert D. Astley, Esq., F.Z.S.
- 1 Partridge (*Perdix cinerea*), ♂. Presented by Geo. Rubie, Esq.
23. 1 Hog Deer (*Cervus porcinus*), ♀. Born in the Menagerie.
- 1 Indian Wild Dog (*Canis primævus*). Presented by T. A. Bulkeley, Esq.
- 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Presented by Mr. J. Abrahams.
- 3 Turquoise Parrakeets (*Euphema pulchella*), 1 ♂ and 2 ♀. Purchased.
- 1 European Pond-Tortoise (*Emys europæa*). Presented by Mr. J. Satcherd.
- 2 Spotted Salamanders (*Salamandra maculosa*). Presented by Mr. J. Satcherd.
- 2 Algerian Tropidosaures (*Tropidosauria algira*). Presented by W. C. Tait, Esq., C.M.Z.S.
- 3 Spine-footed Lizards (*Acanthodactylus vulgaris*). Presented by W. C. Tait, Esq., C.M.Z.S.
- 1 Adorned Ceratophrys (*Ceratophrys ornata*). Presented by Capt. Hairby.
24. 1 Carrion-Crow (*Corvus corone*). Purchased.
- 1 Bengal Vulture (*Gyps bengalensis*). Purchased.
- 2 Coscoroba Swans (*Cygnus coscoroba*). Purchased.
25. 1 White-collared Mangabey (*Cercocebus collaris*), ♂. Presented by Mrs. Du Heaume.
- 1 Black-eared Marmoset (*Hapale penicillata*), ♀ Presented by Mrs. C. Spencer Stanhope.
- 2 Chaplain Crows (*Corvus capellanus*). From Fao, Persian Gulf. Presented by B. T. Finch, Esq., C.M.Z.S.
- 3 Common Sheldrakes (*Tadorna vulpanser*). Bred in the Gardens.
- 5 Chilian Pintails (*Dafla spinicauda*). Bred in the Gardens.
- 5 Summer Ducks (*Æ. sponsa*). Bred in the Gardens.
- 1 Orange-winged Amazon (*Chrysotis amazonica*). Deposited.
26. 10 Hybrid Ceylonese Jungle-fowls (between *Gallus stanleyi* and *G. bankiva*). Bred in the Gardens.
- 4 Himalayan Monauls (*Lophophorus impeyanus*). Bred in the Gardens.
- 5 Sonnerat's Jungle-fowls (*Gallus sonnerati*). Bred in the Gardens.
27. 1 Brown-throated Conure (*Conurus ceruginosus*). Deposited.
- 1 Yellow Conure (*Conurus solstitialis*). Deposited.
- 2 Black Guillemots (*Uria grylle*). Received in Exchange.
28. 1 Guianan Tree-Porcupine (*Sphingurus insidiosus*). From Demerara. Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 1 Rough Fox (*Canis rudis*). From Demerara. Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 2 Passerine Parrots (*Psittacula passerina*). Deposited.
- 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Mrs. W. Moir.
- July 1. 1 Blue Crested Tanager (*Stephanophorus leucocephalus*), ♂. Purchased.
- 2 Cape Doves (*Ena capensis*), ♂ and ♀. Purchased.

- July 1. 1 Razorbill (*Alca torda*). Presented by Lady Hayter.  
 1 Tuatera Lizard (*Sphenodon punctatus*). Presented by Surg.-Maj. G. Henderson.
2. 1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.  
 2 Angulated Tortoises (*Chersina angulata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 2 Geometric Tortoises (*Testudo geometrica*). From Little Namqua-land. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 2 Areolated Tortoises (*Homopus areolatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 2 Ceylonese Terrapins (*Clemmys trijuga*). From the Island of Diego Garcia. Presented by Comm. the Hon. Foley C. P. Vereker, R.N.  
 5 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
3. 1 Red Deer (*Cervus elaphus*), ♂. Born in the Menagerie.  
 2 Diana Monkeys (*Cercopithecus diana*), ♂ and ♀. Presented by J. H. Cheetham, Esq., F.Z.S.  
 4 Snow-birds (*Junco hyemalis*). Presented by F. J. Thompson, Esq.  
 1 American Coot (*Fulica americana*). Presented by F. J. Thompson, Esq.  
 1 Hutchin's Goose (*Bernicla hutchinsi*). Presented by W. A. Conklin, Esq., C.M.Z.S.  
 1 King Vulture (*Gypagus papa*, jr.). Presented by W. A. Conklin, Esq., C.M.Z.S.  
 1 Heloderm (*Heloderma suspectum*). Received in Exchange. See P. Z. S. 1884, p. 475.  
 1 Clouded Iguana (*Cyclura nubila*). Received in Exchange.  
 1 Pale-headed Tree-Boa (*Epicrates angulifer*). Presented by Mrs. Blake. From the Island of New Providence, Bahamas.  
 1 Antillean Snake (*Dromicus antillensis*). Presented by Mrs. Blake. From the Island of New Providence, Bahamas.  
 2 Maculated Snakes (*Ungalia maculata*). Presented by Mrs. Blake. From the Island of New Providence, Bahamas.
4. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. Norman Yonge.  
 1 Spotted Cavy (*Ceologenys paca*). Purchased.  
 1 Barn-Owl (*Strix flammea*). Presented by M. B. Windus, Esq.  
 3 Hardwicke's Spur-fowls (*Galloperdix bimaculata*), 2 ♂ and 1 ♀. Purchased.  
 2 Rufous Spur-fowls (*Galloperdix spadicea*), ♂ and ♀. Purchased.  
 2 Rain-Quails (*Coturnix coromandelica*), ♂ and ♀. Purchased.  
 3 Blackish Sternotheres (*Sternotherus subniger*). Purchased.
5. 1 Blue-and-Yellow Macaw (*Ara ararauna*). Deposited.
8. 2 Quebec Marmots (*Arctomys monax*), ♂ and ♀. Presented by N. Stainfield, Esq.  
 1 Prairie-Wolf (*Canis latrans*). Presented by R. Payze, Esq. Captured in Epping Forest.  
 4 Common Vipers (*Vipera berus*). Presented by Walter E. Blaker, Esq.
9. 1 Hybrid Lühdorf's Deer (between *Cervus luehdorfi*, ♂, and *Cervus canadensis*, ♀). Born in the Menagerie.

- July 9. 1 Hybrid Fallow Deer (between *Dama mesopotamica*, ♂, and *Dama vulgaris*, ♀). Born in the Menagerie.  
 1 Red Deer (*Cervus elaphus*), ♀. Born in the Menagerie.  
 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
10. 1 Weeper Capuchin (*Cebus capucinus*), ♂. Purchased.  
 4 Beautiful Finches (*Estrela bella*), 2 ♂ and 2 ♀. Purchased.  
 2 Swift Parrakeets (*Lathamus discolor*), ♂ and ♀. Presented by Mr. J. Abrahams.  
 3 Suricates (*Suricata tetradactyla*). Presented by W. R. Dobbin, Esq.  
 2 Red-beaked Weaver-Birds (*Quela sanguinirostris*), ♂ and ♀. Presented by Mrs. Nettleship.  
 2 Grey Parrots (*Psittacus erithacus*). Deposited.
11. 4 Australian Wild Ducks (*Anas superciliosa*). Bred in the Gardens.  
 1 Mandarin Duck (*Aix galericulata*). Bred in the Gardens.  
 1 Lanner Falcon (*Falco lanarius*). Purchased.  
 12. 4 Elliot's Pheasants (*Phasianus ellioti*), 2 ♂ and 2 ♀. Received. Hatched April 1884.  
 8 King Crabs (*Limulus polyphemus*). Purchased.  
 2 Smooth Snakes (*Coronella levis*). Presented by the Rev. Chas. Harris.
14. 3 Common Squirrels (*Sciurus vulgaris*). Purchased.  
 1 Short-toed Eagle (*Circæus gallicus*). Presented by W. R. Taylor, Esq.
15. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mrs. A. Edwards.  
 5 Natterjack Toads (*Bufo calamita*). Presented by Mr. W. Stanley.
16. 3 Striolated Buntings (*Emberiza striolata*). Deposited.  
 6 Aldrovandi's Lizards (*Plestiodon auratus*). Purchased.
17. 1 Four-horned Antelope (*Tetraceros quadricornis*), ♀. Purchased.  
 1 MacCarthy's Ichneumon (*Herpestes maccarthie*). Purchased.
18. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Lieut. A. H. Oliver, R.N.
19. 1 Bronze-winged Pigeon (*Phaps chalcoptera*). Presented by J. Latham, Esq.
20. 2 Virginian Deer (*Cariacus virginianus*). Born in the Gardens.  
 1 Argus Pheasant (*Argus giganteus*). Bred in the Menagerie.
21. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by J. H. Harling, Esq.  
 1 Common Squirrel (*Sciurus vulgaris*). Purchased.  
 1 Mule Deer (*Cariacus macrotis*). Born in the Menagerie.  
 2 Daubenton's Curassow (*Crax daubentoni*), ♂ and ♀. Presented by W. Burch, Esq.  
 1 Common Guinea-fowl (*Numida meleagris*). Presented by W. Burch, Esq.  
 2 Indian Kites (*Milvus govinda*). Presented by Mr. W. Jamrach.
22. 2 Green Conures (*Conurus pauva*). Purchased.  
 1 Blackish Sternother (Sternotherus subniger). Purchased.  
 1 Mohr Gazelle (*Gazella mohr*), ♀. Purchased.  
 1 White-bellied Sea-Eagle (*Haliaeetus leucogaster*). Purchased.  
 1 Common Boa (*Boa constrictor*). Purchased.  
 2 Electric Eels (*Gymnotus electricus*). Purchased.

- July 22. 1 Barn-Owl (*Strix flammea*). Presented by G. H. Garrett, Esq.
- 2 Mule Deer (*Cariacus macrotis*), ♂ and ♀. Presented by Gerald Waller, Esq., F.Z.S.
- 6 Four-banded Snakes (*Elaphis quadrigata*). From Japan. Presented by Gerald Waller, Esq., F.Z.S. See P. Z. S. 1884, p. 475.
- 3 Tigrine Snakes (*Tropidonotus tigrinus*). From Japan. Presented by Gerald Waller, Esq., F.Z.S.
- 1 Blomhoff's Snake (*Trionocephalus blomhoffi*). From Japan. Presented by Gerald Waller, Esq., F.Z.S.
- 3 American Black Snakes (*Coluber constrictor*). Presented by Gerald Waller, Esq., F.Z.S.
- 1 Cyclopion Snake (*Tropidonotus cyclopion*). Presented by Gerald Waller, Esq., F.Z.S.
- 1 Mexican Snake (*Pituophis mexicanus*). Presented by Gerald Waller, Esq., F.Z.S.
- 2 Copper-headed Snakes (*Cenchris contortrix*). Presented by Gerald Waller, Esq., F.Z.S.
- 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Gerald Waller, Esq., F.Z.S.
23. 1 Violet-necked Lory (*Eos riciniata*). Purchased.
- 3 Elliot's Pheasants (*Phasianus ellioti*). Received. Hatched April 1884.
- 1 Smooth Snake (*Coronella laevis*). Presented by W. H. B. Pain, Esq.
25. 1 Cape Sea-Lion (*Otaria pusilla*). From Cape Colony. Presented by John Hewat, Esq. See P. Z. S. 1884, p. 475.
- 3 Angulated Tortoises (*Chersina angulata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 2 Geometric Tortoises (*Testudo geometrica*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 2 White-backed Piping-Crows (*Gymnorhina leuconota*). Deposited.
- 1 Smooth Snake (*Coronella laevis*). Presented by F. H. Jennings, Esq.
26. 1 Mesopotamian Fallow-Deer (*Dama mesopotamica*), ♂. Born in the Menagerie.
27. 2 Common Cormorants (*Phalacrocorax carbo*). Deposited.
28. 1 King Vulture (*Gypagus papa*). Presented by August Strunz, Esq.
- 2 Red-tailed Buzzards (*Buteo borealis*). Presented by D. Morris, Esq.
29. 1  $\frac{3}{4}$ -bred Fallow-Deer (between *Dama mesopotamica*, ♂, and hybrid *Dama vulgaris*). Born in the Menagerie.
- 1 Martinique Waterhen (*Ionornis martinicus*). Presented by Mrs. A. Jones.
- 1 Black Hornbill (*Sphagolobus atratus*). Purchased.
- 1 African Barbet (*Trachyphonus purpuratus*). Purchased. See P. Z. S. 1884, p. 476.
30. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss A. E. Sturge.
- 1 Common Fox (*Canis vulpes*). Presented by Mr. Thos. Legg.
- 2 Jackdaws (*Corvus monedula*). Presented by Mrs. Frank.
- 1 Anaconda (*Eunectes murinus*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
31. 1 Golden-crowned Conure (*Conurus aureus*). Deposited.

- Aug. 1. 1 Kestrel (*Tinnunculus alaudarius*). Presented by Mr. G. Westrup.
2. 1 Crested Curassow (*Crax alector*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 1 Grey Amphisbæna (*Blanus cinereus*). From Portugal. Presented by W. C. Tait, Esq., C.M.Z.S.
3. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by the Rev. T. Rickards.
4. 1 Mule Deer (*Cariacus macrotis*). Born in the Menagerie.
- 1 Rough-legged Buzzard (*Archibuteo lagopus*). Presented by Sir R. Payne Gallwey, Bart.
5. 2 Rose-crested Cockatoos (*Cacatua moluccensis*). Presented by Charles Clifton, Esq., F.Z.S.
- 3 Greater Sulphur-crested Cockatoos (*Cacatua galerita*). Presented by Charles Clifton, Esq., F.Z.S.
- 3 Leadbeater's Cockatoos (*Cacatua leadbeateri*). Presented by Charles Clifton, Esq., F.Z.S.
- 1 Red-sided Eclectus (*Eclectus pectoralis*). Presented by Charles Clifton, Esq., F.Z.S.
- 1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Charles Clifton, Esq., F.Z.S.
- 1 White-backed Piping-Crow (*Gymnorhina leuconota*). Presented by Charles Clifton, Esq., F.Z.S.
- 6 Amherst Pheasants (*Thaumalea amherstiae*). Presented by Charles Clifton, Esq., F.Z.S.
- 8 Himalayan Monauls (*Lophophorus impeyanus*). Presented by Charles Clifton, Esq., F.Z.S.
- 2 Javan Peafowls (*Pavo spicifer*), 2 ♂. Presented by Charles Clifton, Esq., F.Z.S.
- 1 Blue-fronted Amazon (*Chrysotis æstiva*). Deposited.
- 1 Grey Parrot (*Psittacus erythacus*). Deposited.
- 3 Cockateels (*Calopsitta nova-hollandiae*). Bred in the Gardens.
- 1 Alligator Terrapin (*Chelydra serpentina*). Deposited.
6. 1 Electric Eel (*Gymnotus electricus*). Purchased.
- 2 Jardine's Parrots (*Psecocephalus guillemi*). Purchased.
- 2 Pearly Conures (*Conurus perlatus*). Purchased.
- 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Deposited.
- 1 Cockateel (*Calopsitta nova-hollandiae*). Presented by J. W. Dixon, Esq.
- 1 Rose-Hill Parrakeet (*Platycercus eximius*). Presented by J. W. Dixon, Esq.
- 1 Green Turtle (*Chelone viridis*). Presented by A. E. Painter, Esq., F.Z.S.
7. 1 Loggerhead Turtle (*Thalassochelys caouana*). Presented by The Surrey Commercial Docks Co.
8. 1 Dingo (*Canis dingo*), ♂. Presented by P. R. Ricardo, Esq.
- 1 Leopard Tortoise (*Testudo pardalis*). Presented by Wm. Lane, Esq.
9. 1 Striped Hyæna (*Hyæna striata*). From Morocco. Presented by Sir John H. Drummond Hay, K.C.B., C.M.Z.S.
- 1 Slow-worm (*Anguis fragilis*). Presented by Mr. T. E. Gunn.
11. 1 Ring-tailed Coati (*Nasua rufa*), ♂. Presented by Miss K. M. Battam.
- 2 Mountain Ka-Kas (*Nestor notabilis*). Purchased.
- 1 Three-coloured Lory (*Lorius tricolor*). Deposited.
- 1 Somali Wild Ass (*Equus somalicus*), ♂. Received in Exchange.
- See P. Z. S. 1884, p. 476. From Somali-land.

- Aug. 11. 2 White-fronted Geese (*Anser albifrons*). Purchased.  
 2 Blue Snow-Geese (*Chen caerulescens*). Purchased. See P. Z. S. 1884, p. 476. From Alaska.  
 2 Smooth Snakes (*Coronella lavis*). Presented by W. H. B. Pain, Esq.
12. 2 Brazilian Cariamias (*Cariama cristata*). Purchased.
13. 2 Patagonian Cavies (*Dolichotis patachonica*). Presented by Frank Parish, Esq., F.Z.S.
- 1 Hairy-rumped Agouti (*Dasyprocta primnolopha*). Presented by Frank Parish, Esq., F.Z.S.
- 1 Ring-tailed Coati (*Nasua rufa*). Presented by Frank Parish, Esq., F.Z.S.
- 2 Rufous Tinamous (*Rhynchotus rufescens*). Presented by Frank Parish, Esq., F.Z.S.
- 2 Tuberculated Iguanas (*Iguana tuberculata*). Presented by Frank Parish, Esq., F.Z.S.
- 1 Pampas Deer (*Cariacus campestris*), ♂. Presented by Master Julian George Parr.
14. 1 Grey Parrot (*Psittacus erythacus*). Presented by E. T. Holway, Esq.
- 10 Common Chameleons (*Chamaleon vulgaris*). Purchased.
- 1 Severe Macaw (*Ara severa*). Deposited.
15. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by H. Livermore, Esq.
- 1 Two-streaked Python (*Python bivittatus*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S.
- 1 Reticulated Python (*Python reticulatus*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S.
- 1 Two-banded Monitor (*Veranus salvator*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S.
- 1 Flying Gecko (*Pychozoon homalocephalum*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1884, p. 476.
- 6 Black-spotted Toads (*Bufo melanostictus*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1884, p. 476.
- 1 Java Porcupine (*Hystrix javanica*). From Java. Presented by Dr. F. H. Bauer, C.M.Z.S.
16. 2 Huanacos (*Lama huanacos*), ♂ and ♀. Presented by Frank Parish, Esq., F.Z.S.
19. 2 Cape Hunting-Dogs (*Lycan pictus*). Purchased.
20. 1 Common Cormorant (*Phalacrocorax carbo*). Received in Exchange.
21. 1 African Elephant (*Elephas africanus*), ♂. From Abyssinia. Deposited by Her Majesty the Queen.
- 1 Red-crested Cardinal (*Paroaria cucullata*). Presented by John W. Miers, Esq.
22. 1 Gelada Baboon (*Theropithecus gelada*), ♀. Presented by H. E. Lidge Mercha Workee, Abyssinian Envoy.
- 10 Duméril's Tortoises (*Podocnemis dumeriliana*). Purchased.
23. 2 Picui Doves (*Columbula picui*). Deposited.
25. 1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by Major Newson D. Garrett.
- 1 Moustache Monkey (*Cercopithecus cephus*), ♂. Presented by G. A. Broderick, Esq.
- 2 Undulated Grass-Parrakeets (*Melopsittacus undulatus*), ♂ and ♀. Presented by E. C. Ash, Esq.

- Aug. 26. 1 Ludio Monkey (*Cercopithecus ludio*). Purchased.  
 1 Banded Aracari (*Pteroglossus torquatus*). Purchased.  
 1 Kit Fox (*Canis velox*). Purchased.  
 1 Naked-eared Deer (*Cariacus gymnotus*). Purchased.  
 1 Ethiopian Wart-Hog (*Phacochoerus ethiopicus*). Purchased.  
 1 Tiger Bittern (*Tigrisoma brasiliense*). Purchased.  
 1 Common Boa (*Boa constrictor*). Purchased.  
 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by H. Johnson, Esq.
27. 1 Squirrel Monkey (*Chrysotrrix sciurea*). Presented by Mrs. J. M. A. King.  
 1 Himalayan Bear (*Ursus tibetanus*). Presented by Percy H. Cooper.  
 1 Common Cuckoo (*Cuculus canorus*). Presented by Mr. William Smith.
28. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Rev. Walter Hudson.  
 1 Red-and-Yellow Macaw (*Ara chloroptera*). Presented by O. J. Prior, Esq.
29. 1 Sharp-nosed Crocodile (*Crocodylus acutus*). Presented by W. T. Lax, Esq.  
 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by W. T. Lax, Esq.  
 1 Indian Eryx (*Eryx johni*). Purchased.
30. 2 Spotted Slow-worms (*Acontias meleagris*). From Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 1 Common Slow-worm (*Anguis fragilis*). Presented by H. Scherren, Esq.
- Sept. 1. 2 Peba Armadillos (*Tatusia peba*). Presented by Frank Parish, Esq., F.Z.S.  
 2. 2 Smooth Snakes (*Coronella levis*). Presented by W. H. B. Pain, Esq.  
 2 Ring-tailed Lemurs (*Lemur catta*), ♂ and ♀. Presented by Charles Stewart, Esq.
3. 1 Grey-cheeked Monkey (*Cercocebus albigena*). Purchased.  
 1 Common Marmoset (*Hapale jacchus*). Presented by J. Henderson, Esq.  
 1 Wood-Owl (*Syrnium aluco*). Presented by Mr. J. Baldwin.  
 7 Common Crowned Pigeons (*Goura coronata*). Deposited.  
 1 Victoria Crowned Pigeon (*Goura victoriae*). Deposited.
4. 1 Prairie-Wolf (*Canis latrans*). Deposited. From Kansas, U. S. A.  
 2 Brazilian Hangnests (*Icterus jamacai*). Deposited.
6. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.
8. 2 Ring-tailed Lemurs (*Lemur catta*). Born in the Menagerie.  
 1 Great Kangaroo (*Macropus giganteus*), ♂. Born in the Menagerie.  
 1 Herring-Gull (*Larus argentatus*). Presented by Miss J. Dunford.  
 1 Tuberculated Iguana (*Iguana tuberculata*). Presented by J. H. Leech, Esq.
9. 1 Yellow-fronted Amazon (*Chrysotis ochrocephala*). Presented by Mrs. Frank Wilson.
10. 1 Brown Capuchin (*Cebus fatuellus*), ♀. Deposited.  
 1 Weeper Capuchin (*Cebus capucinus*). Deposited.

- Sept. 10. 1 Tigrine Cat (*Felis tigrina*). Presented by James Meldrum, Esq.  
 2 Ring-tailed Coatis (*Nasua rufa*). Presented by James Meldrum, Esq.  
 1 Cape Hunting-Dog (*Lycan pictus*). Presented by Capt. J. Grant Elliott.
11. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). Presented by Mrs. E. A. Alldridge.  
 1 Purple-faced Monkey (*Semnopithecus leucopymnus*). Presented by D. Palgrave Turner, Esq.  
 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by D. Palgrave Turner, Esq.  
 3 Ruddy Flamingos (*Phœnicopterus ruber*). Purchased.
12. 1 Side-striped Jackal (*Canis lateralis*). Presented by W. P. Williams, Esq.
13. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Deposited.  
 2 Yellow-winged Sugar-birds (*Cæreba cyanea*), 2 ♂. Presented by P. A. Fraser, Esq.  
 1 Black-headed Sugar-bird (*Chlorophanes atricapilla*), ♂. Presented by P. A. Fraser, Esq.  
 3 Violaceous Night-Herons (*Nycticorax violaceus*). Presented by A. Boon, Esq., F.R.C.S. From St. Kitt's, W. I.  
 2 Victoria Crowned Pigeons (*Goura victoria*). Deposited.
15. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Deposited.  
 1 Spanish Terrapin (*Clemmys leprosa*). Presented by Master A. Brierly.
16. 1 Common Hangnest (*Icterus vulgaris*). Deposited.
17. 1 Blackcap (*Sylvia atricapilla*), ♂. Presented by Mr. H. Keilich.  
 2 Black-billed Tree-Ducks (*Dendrocygna arborea*). Presented by C. Arthur Shand, Esq. From Antigua, W. I.  
 1 Horned Lizard (*Phrynosoma cornutum*). Presented by A. R. Wallace, Esq., F.Z.S.
18. 1 Coypu (*Myopotamus coypus*). Presented by Frank Parish, Esq., F.Z.S.  
 3 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.  
 2 Half-collared Turtle-Doves (*Turtur semitorquatus*). Purchased.  
 2 Triangular-spotted Pigeons (*Columba guinea*). Purchased.  
 2 Bronze-spotted Doves (*Chalcopelia chalcospila*). Purchased.  
 4 Harlequin Quails (*Coturnix histrionica*). Purchased.  
 1 Allen's Porphyrio (*Hydromia alleni*). Purchased.  
 2 North-African Jackals (*Canis anthus*). Deposited.
19. 1 Australian Fruit-Bat (*Pteropus poliocephalus*). Presented by Capt. D. C. Long.  
 1 Indian Python (*Python molurus*). Presented by A. A. Dalmege, Esq., F.R.G.S.
20. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by A. Bowden, Esq.  
 1 Ludio Monkey (*Cercopithecus ludio*). Presented by A. Bowden, Esq.  
 1 Tawny Owl (*Syrnium aluco*). Presented by Miss H. Freeman.
21. 1 Levaillant's Cynictis (*Cynictis penicillata*). Born in the Menagerie.
22. 1 Toque Monkey (*Macacus pileatus*), ♀. Presented by Mrs. Batchelder.  
 1 White-breasted Kingfisher (*Halcyon smyrnensis*). Purchased.

- Sept. 22. 1 Tree-Boa (*Corallus hortulanus*). Purchased.  
 1 Common Viper (*Vipera berus*). Presented by Mr. Wm. Cross.  
 1 Viperine Snake (*Tropidonotus viperinus*). Presented by Mr. Wm. Cross.
23. 6 Great Bats (*Vespertilio noctula*). Presented by Mr. W. Atkinson.  
 2 King Parrakeets (*Aprosmictus scapulatus*). Presented by Mrs. C. Price.  
 2 Cockateels (*Calopsitta novæ-hollandiæ*). Presented by Mrs. C. Price.  
 2 Reed-Buntings (*Emberiza schæniclus*). Purchased.  
 1 Blackcap (*Sylvia atricapilla*), ♂. Purchased.
24. 1 Common Marmoset (*Hapale jacchus*), ♂. Presented by W. E. Steinschen, Esq.
25. 2 Spanish Terrapins (*Clemmys leprosa*). Presented by W. H. J. Paterson, Esq.
26. 1 Pied Wagtail (*Motacilla lugubris*). Purchased.  
 1 Common Snake (*Tropidonotus natrix*). Presented by W. H. B. Pain, Esq.  
 1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.
27. 1 Axis Deer (*Cervus axis*). Born in the Menagerie.  
 2 Great Bustards (*Otis tarda*), 2 ♀. Deposited.  
 1 Mute Swan (*Cygnus olor*, var. *immutabilis*). Presented by J. H. Gurney, Esq., F.Z.S.
29. 1 Erxleben's Monkey (*Cercopithecus erxlebeni*), ♀. Purchased.  
 1 Maimed Gecko (*Peropus mutilatus*). Deposited.
30. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by W. Phillips, Esq.  
 2 Great Bats (*Vespertilio noctula*). Presented by Capt. W. St. George Ord.
- Oct. 1. 1 Common Marmoset (*Hapale jacchus*). Deposited.  
 1 Black-eared Marmoset (*Hapale penicillata*). Deposited.  
 1 Alligator (*Alligator mississippiensis*). Deposited.
2. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♀. Deposited.  
 1 Brazilian Teal (*Querquedula brasiliensis*), ♂. Purchased.
3. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). Presented by Miss Ethel A. Hutton.  
 2 Small Hill-Mynahs (*Gracula religiosa*). Deposited.  
 1 Blue-bearded Jay (*Cyanocorax cyanopogon*). Deposited.
4. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Mrs. S. Russell.
6. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.  
 1 White-backed Piping-Crow (*Gymnorhina leuconota*). Presented by F. Langworthy, Esq.  
 1 Sulphur-crested Toucan (*Ramphastos carinatus*). Deposited.  
 2 Loggerhead Turtles (*Thalassochelys caouana*). Presented by Allen McGregor, Esq. From the Mediterranean.
8. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by A. F. M. Smith, Esq.
9. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.  
 1 Common Chameleon (*Chameleon vulgaris*). Presented by Mr. A. R. Rogers.  
 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Capt. H. Mends.

- Oct. 9. 1 Brown Mud-Frog (*Pelobates fuscus*). Presented by Claude Russell, Esq.
10. 1 Brown Capuchin (*Cebus fatuellus*). Presented by G. S. Malet Barrow, Esq.
- 1 Robben-Island Snake (*Coronella phocorum*). Deposited.
13. 1 Meadow-Pipit (*Anthus pratensis*). Presented Mr. T. E. Gunn.
- 6 Twites (*Linota flavirostris*). Presented by Mr. T. E. Gunn.
- 1 Linnet (*Linota cannabina*). Presented by Mr. T. E. Gunn.
- 8 Lesser Redpolls (*Linota rufescens*). Presented by Mr. T. E. Gunn.
- 3 Cockateels (*Calopsitta novæ-hollandiæ*). Bred in the Gardens.
14. 1 Moustache Monkey (*Cercopithecus cephus*). Deposited.
- 6 Coypus (*Myopotamus coypus*). Born in the Menagerie.
- 2 Robben-Island Snakes (*Coronella phocorum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
15. 1 Hardwicke's Mastigure (*Uromastix hardwickii*). Presented by Cuthbert Johnson, Esq.
16. 6 Ruddy Flamingos (*Phœnicopterus ruber*). Purchased.
18. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
- 1 Blue-and-yellow Macaw (*Ara ararauna*). Deposited.
20. 4 Hardwicke's Mastigures (*Uromastix hardwickii*). Received in exchange.
- 2 Bengal Monitors (*Varanus bengalensis*). Received in exchange.
- 1 Nilotic Crocodile (*Crocodilus vulgaris*). Received in exchange.
- 1 Talapoin Monkey (*Cercopithecus talapoin*). Purchased.
- 1 Allen's Galago (*Galago alleni*). Purchased.
- 1 Bengal Fox (*Canis bengalensis*). Purchased.
- 1 Black-necked Coly (*Colius nigricollis*). Purchased. See P. Z. S. 1884, p. 530, pl. xlv. fig. 1.
- 1 Thick-billed Pigeon (*Treron macrorhyncha*). Purchased.
- River-Jack Viper (*Vipera rhinoceros*). Purchased.
- 1 Buff-breasted Partridge (*Ptilopachys ventralis*). Purchased.
21. 2 Lesser Sulphur-crested Cockatoos (*Cacatua sulphurea*). Deposited.
- 1 Mute Swan (*Cygnus olor*), ♂. Presented by Lady Siemens.
- 1 Hedgehog (*Erinaceus europæus*). Presented by Mr. C. G. Hopkins.
- 2 Horrid Rattlesnakes (*Crotalus horridus*). Purchased.
22. 1 Grivet Monkey (*Cercopithecus griseo-iridis*), ♂. Presented by Mrs. R. E. Villiers.
- 1 Common Chameleon (*Chamæleon vulgaris*). Presented by F. H. Jennings, Esq.
- 1 Common Viper (*Vipera berus*). Presented by F. H. Jennings, Esq.
23. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Thos. Eley, Esq.
- 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Mrs. A. M. Packard.
- 1 Proteus (*Proteus anguinus*). Presented by W. J. Milles, Esq.
24. 3 Common Marmosets (*Hapale jacchus*). Deposited.
- 1 Common Paradoxure (*Paradoxurus typus*). Presented by Mrs. L. McArthur.
25. 2 St.-Helena Seed-eaters (*Crithagra butyracea*). Presented by W. B. Cheadle, Esq., F.Z.S.
26. 6 Canadian Beavers (*Castor canadensis*). Deposited.

- Oct. 28. 1 Rhesus Monkey (*Macacus rhesus*), ♀: Presented by Mrs. E. A. Russell.
- 1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Miss N. Simmonds.
- 1 Westerman's Cassowary (*Casuarinus westermanni*). Deposited.
- 1 Northern Mocking-bird (*Mimus polyglottus*). Presented by Thos. G. Venables, Esq.
- 1 Common Chameleon (*Chamaeleon vulgaris*). Presented by W. G. Brinkley, Esq.
29. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Richard Armytage, Esq.
30. 1 Cape Ant-bear (*Orycteropus capensis*). Purchased.
- 1 Greater White-crested Cockatoo (*Cacatua cristata*). Deposited.
- 2 Herring-Gulls (*Larus argentatus*). Presented by Mrs. Pigou.
- Nov. 1. 1 Grand Eclectus (*Eclectus roratus*). Presented by Miss Lawson.
- 1 Black-headed Caique (*Caica melanocephala*). Purchased.
- 1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by F. Hale, Esq., F.Z.S.
- 1 Alligator (*Alligator mississippiensis*). Presented by R. M. Middleton, Esq.
2. 1 Water-Rail (*Rallus aquaticus*). Presented by Mr. T. E. Gunn.
- 1 Moorhen (*Gallinula chloropus*). Presented by Mr. T. E. Gunn.
4. 1 Brown Capuchin (*Cebus fatuellus*), ♂. Deposited.
- 1 Great Grey Shrike (*Lanius excubitor*). Purchased. From Bedfordshire.
- 6 Alexandrine Parrakeets (*Palaornis alexandri*). From British Burmah. Presented by Eugene W. Oates, Esq., F.Z.S.
- 1 Blossom-headed Parrakeet (*Palaornis cyanocephalus*). From British Burmah. Presented by Eugene W. Oates, Esq., F.Z.S.
- 1 Banded Parrakeet (*Palaornis fasciatus*), ♀. From British Burmah. Presented by Eugene W. Oates, Esq., F.Z.S.
- 6 Curlews (*Numenius arquata*). Purchased.
5. 1 Ring-necked Parrakeet (*Palaornis torquatus*), ♀. Presented by Miss Perry.
- 1 Rose-ringed Parrakeet (*Palaornis docilis*), ♀. Presented by Mr. W. G. Burrows.
- 1 Blue-winged Teal (*Querquedula cyanoptera*), ♂. Received in exchange.
6. 1 Barbary Ape (*Macacus inuus*). Presented by R. B. Colvin, Esq.
- 1 Anubis Baboon (*Cynocephalus anubis*), ♂. Presented by R. B. Colvin, Esq.
- 1 Siamese Blue Pie (*Urocissa magnirostris*), ♂. Presented by Chas. Clifton, Esq., F.Z.S.
7. 1 Weka Rail (*Ocydromus australis*), white variety. Presented by J. Satchell Studley, Esq.
8. 2 Pronghorn Antelopes (*Antilocapra americana*), ♂ and ♀. Deposited.
- 1 Ring-tailed Coati (*Nasua rufa*), ♀. Presented by C. M. Courage, Esq.
10. 1 Short-eared Owl (*Asio brachyotus*). From Griqualand West, S. Africa. Presented by Mrs. L. Weil.
- 1 Lesser Kestrel (*Tinnunculus cenchris*). Presented by Mrs. L. Weil.

- Nov. 11. 1 Reindeer (*Rangifer tarandus*), ♂. Purchased. From Labrador.
12. 1 Golden-winged Woodpecker (*Colaptes auratus*). Purchased.  
1 South-American Rat-Snake (*Spilotes variabilis*). Purchased.
13. 1 Asiatic Wild Ass (*Equus onager*), ♂. From Cutch. Presented by Lieut.-Col. R. A. Crawford.
14. 1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by J. A. Cameron, Esq.  
2 Tasmanian Wolves (*Thylacinus cynocephalus*). Purchased. See P. Z. S. 1884, p. 561.  
1 Common Cormorant (*Phalacrocorax carbo*). Presented by S. S. Mossop, Esq.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
17. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Deposited.
19. 1 Common Seal (*Phoca vitulina*). Presented by James Wyatt, Esq.  
1 Bernier's Ibis (*Ibis bernieri*). Received in exchange.
20. 1 Red-tailed Amazon (*Chrysotis erythrura*). Purchased. See P. Z. S. 1884, p. 562.  
1 Red-throated Amazon (*Chrysotis collaria*). Purchased.
21. 2 Barred Doves (*Geopelia striata*). Presented by Mr. Emil Berg.  
3 Eastern Turtle-Doves (*Turtur meena*?). Presented by Mr. Emil Berg.  
3 Lesser Snow-Geese (*Chen albatus*). Purchased.
24. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Deposited.  
1 Tachiro Goshawk (*Astur tachiro*). Presented by Lord Lilford, F.Z.S.
25. 2 King Parrakeets (*Aprosmictus scapulatus*), ♂ and ♀. Presented by E. Meek, Esq.
26. 1 Rufous-necked Weaver-bird (*Hyphantornis textor*), ♀. Received in exchange.  
6 Golden Orfe (*Leuciscus vulgaris*, var.). Purchased.
27. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. W. J. Bennett.  
1 Rhesus Monkey (*Macacus rhesus*). Presented by Samuel Levi, Esq.  
4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
28. 1 Cheer Pheasant (*Phasianus wallichii*), ♀. Presented by E. C. Buck, Esq.
29. 1 Ocelot (*Felis pardalis*). Presented by H. B. Whitmarsh, Esq.
- Dec. 1. 2 Rock-Pipits (*Anthus obscurus*). Purchased.  
2. 1 Passerine Owl (*Glaucidium passerinum*). Purchased. From Siberia.  
3. 1 South-American Otter (*Lutra platensis*). Deposited.  
1 Crested Titmouse (*Parus cristatus*). Purchased.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Geo. Airey.
5. 1 Yellow Baboon (*Cynocephalus babouin*), ♂. Presented by Capt. Edward Jones, R.N.R.  
1 Chacma Baboon (*Cynocephalus porcaricus*), ♀. Presented by Capt. Edward Jones, R.N.R.  
1 Bittern (*Botaurus stellaris*). Presented by Robert Page, Esq.  
1 Cat-fish (*Amiurus catus*). Deposited.
8. 3 Lions (*Felis leo*). Born in the Menagerie.  
1 Indian Python (*Python molurus*). Deposited.

- Dec. 9. 1 Black-and-White Harrier (*Circus melanoleucus*). Presented by Lord Lilford, F.Z.S.
10. 1 Gold Pheasant (*Thaumalea picta*), ♂. Deposited.
12. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. John Roberts.
- 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mr. John Roberts.
13. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by David McCance, Esq.
- 1 Banded Gymnogene (*Polyboroides typicus*, jr.). Deposited.
15. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Deposited.
- 1 Tawny Owl (*Syrnium aluco*). Presented by Mr. W. P. Clark.
- 1 Common Rhea (*Rhea americana*), ♂. Presented by Lady Brassey, F.Z.S.
16. 1 Green-headed Tanager (*Calliste tricolor*). Deposited.
- 2 Common Guillemots (*Lomvia troile*). Purchased.
- 1 Razorbill (*Alca torda*). Purchased.
17. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by R. O. L. Ogilby, Esq.
- 1 Common Roe (*Capreolus caprea*). Presented by C. Hambro, Esq.
18. 1 Silvery Gibbon (*Hylobates leuciscus*), ♀. Presented by C. H. A. Hervey, Esq.
- 1 Greater Black-backed Gull (*Larus marinus*). Presented by Mr. T. E. Gunn.
- 1 Herring-Gull (*Larus argentatus*). Presented by Major H. W. Feilden, C.M.Z.S.
- 1 Common Gull (*Larus canus*). Presented by Major H. W. Feilden, C.M.Z.S.
- 3 Greater Black-backed Gulls (*Larus marinus*). Presented by Major H. W. Feilden, C.M.Z.S.
- 3 Black-headed Gulls (*Larus ridibundus*). Presented by Major H. W. Feilden, C.M.Z.S.
19. 1 Hobby (*Falco subbuteo*). Deposited.
20. 1 Bonnet-Monkey (*Macacus sinicus*). Presented by Mrs. J. N. L. Boljahn.
- 2 Michie's Deer (*Elaphodus michianus*), ♂ and ♀. Deposited.
- 1 Hairy-fronted Muntjac (*Cervulus crinifrons*), ♂. Deposited. See P. Z. S. 1884, p. 1.
21. 1 Vervet Monkey (*Cercopithecus lalandii*). Deposited.
22. 1 Broad-fronted Crocodile (*Crocodilus frontatus*). Presented by J. M. Harris, Esq.
- 1 Nilotic Crocodile (*Crocodilus vulgaris*). Presented by J. M. Harris, Esq.
- 2 Golden-winged Woodpeckers (*Colaptes auratus*). Received in exchange.
- 1 Blue Jay (*Cyanocitta cristata*). Received in Exchange.
- 1 Black-tailed Hawfinch (*Coccothraustes melanurus*). Received in exchange.
- 2 Red-headed Finches (*Amadina erythrocephala*), 2 ♂. Received in exchange.
- 2 Banded Parrakeets (*Palæornis fasciatus*), ♂ and ♀. Received in exchange.
- 1 Red-bellied Squirrel (*Sciurus variegatus*). Received in exchange.
23. 1 Grey Parrot (*Psittacus erithacus*). Presented by Mrs. White-law.

- Dec. 23. 1 Kestrel (*Tinnunculus alaudarius*). Presented by Mr. T. E. Gunn.
24. 1 Sparrow-Hawk (*Accipiter nisus*). Presented by Mr. T. E. Gunn.
26. 1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Deposited.
27. 1 Indian Civet (*Viverricula malaccensis*). Presented by W. Getty, Esq.
28. 1 Bengalese Cat (*Felis bengalensis*). Presented by G. T. Egan, Esq.
29. 1 Vervet Monkey (*Cercopithecus lalandi*), ♂. Presented by J. W. Moon, Esq.
30. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mrs. M. E. Mackern.
- 1 Nubian Ibex (*Capra nubiana*), ♂. Presented by Mrs. Laing. From Upper Nubia. See P. Z. S. 1884, p. 1.
- 1 Hybrid Nubian Ibex (between *Capra nubiana* ♂ and *Capra hircus* ♀), ♂. Presented by Mrs. Laing.
- 1 Domestic Goat (*Capra hircus*), ♀. Presented by Mrs. Laing.
31. 1 Golden Eagle (*Aquila chrysaetus*). Presented by Major-Gen. H. A. Browne. From Sutherlandshire.



# INDEX.

Abdimia  
*sphenorhyncha*, 551.

Acanthias  
*vulgaris*, 44.

Acanthoglossus  
*bruyni*, 150.

Acantholipes  
*affinis*, 518.

Aceros  
*nepalensis*, 251.

Acestrura  
*mulisanti*, 306.

Achæa  
*catilla*, 498.  
*melicerte*, 521.

Acherontia  
*styx*, 513.

Acidalia  
*defixaria*, 324.  
*perdilaria*, 324.

Acirsa  
*prælonga*, 141.

Aolis  
*ascaris*, 342.  
*exigua*, 343.  
*gulsoni*, 344.  
*supranitida*, 342,  
343.  
*terebialis*, 343.  
—, var. *minor*, 343.  
*ventrosa*, 344.  
*walleri*, 343, 344.

Acontia  
*hortensis*, 517, 529.  
*solaris*, 517.

Acraea  
*adnatha*, 221.  
*cœcilia*, 221.  
*calyce*, 221, 229.  
*daira*, 221, 229.  
*lycia*, 220, 221.  
*lycoa*, 222.  
*pseudogina*, 221.  
*serena*, 222.  
*vinidia*, 222.

Actæodes  
*pubescens*, 10, 11.

Actæon  
*pygmaea*, 123.

Addisonia  
*eccentros*, 148.

Adelocera  
*cincta*, 215.

Adelomyia  
*melanogenys maculata*,  
305.

Adisura  
*leucantoides*, 518.

Adoretus  
*cinerarius*, 405.  
*rugulosus*, 405.

Aedon  
*abyssinicus*, 231.

Ægialitis  
*geoffroyi*, 433.

Ægithalopsis  
*galinieri*, 231, 232.

Ægocera  
*latreillii*, 227.

*magna*, 227.  
*rectilinea*, 227.  
*venulia*, 514.

Aellopus  
*tantalus*, 321.

Æthemenes  
*forbesi*, 460.  
*nigro-punctatus*, 460.

Agabotus  
*brunescens*, 460.

Aglæactis  
*cupreipennis*, 304.

Agraulis  
*vanillæ*, 315.

Agrostis  
sp. ?, 323.  
*aristifera*, 516.

Alcedo  
*ispida*, 588.

Aletis  
*forbesi*, 227, 229.

Aloa  
*punctivitta*, 227.

Alseonax  
*adusta*, 230.  
*minima*, 230.

Alvania  
*asperula*, 116.  
*lineata*, 122.  
*reticulata*, 112.  
*supranitida*, 343.  
*tessellata*, 114.  
*weinkauffi*, 113.

Amarygmus  
sp., 216.

Amazilia  
*riefferi jucunda*, 306.

Ambulyx  
*strigilis*, 321.

Amphidesma  
*castaneum*, 145.

Amussium  
*fenestratum*, 143.  
*lucidum*, 143.

Amyna  
*cephusalis*, 496.  
*stellata*, 495, 496.  
*stigmatula*, 495, 496.

Anabazenops  
*subalaris*, 300.  
*temporalis*, 300.

Anæa  
*dominicana*, 316, 320.  
*echemus*, 316.  
*verticordia*, 316.

Anæretes  
*parulus æquatorialis*,  
296.

Anartia  
*iatrophe*, 316.

Anas  
*assimilis*, 173, 174.  
*bernieri*, 175.  
*capensis*, 172, 173,  
174.  
*guttata*, 173.

- Anas**  
*larvata*, 173, 174.  
*sparsa*, 173.  
**Anceryx**  
*alope*, 321.  
**Andigena**  
*laminirostris*, 308.  
**Aneitia**  
*macdonaldii*, 273.  
**Anomala**  
*flaveola*, 404.  
*forbesi*, 404.  
**Anomalanthus**  
*tumidus*, 44.  
**Anomia**  
*ephippium*, 142.  
*patelliformis*, 142.  
**Anoploenemis**  
*curvipes*, 461.  
**Anser**  
*brachyrhynchus*, 176.  
**Anthocaris**  
*etrida*, 510.  
*nouna*, 491.  
**Anthophila**  
*bulia*, 518, 529.  
*zamia*, 518, 529.  
**Anthopsyche**  
*epigone*, 490.  
**Anthus**  
*bogotensis*, 285.  
*cervinus*, 206.  
*spinoletta*, 206.  
**Antilope**  
*tendal*, 48.  
**Apamea**  
*natalensis*, 228.  
**Aphnæus**  
*acamas*, 507.  
**Aporodes**  
*meleagrisalis*, 524.  
**Ara**  
*antiquata*, 143.  
*frielei*, 143.  
*lactea*, 143.  
*noe*, 143.  
*nodulosa*, var. *scabra*, 143.  
*tetragona*, 143.  
**Archetypus**  
*castaneus*, 217, 219.  
*rugosus*, 213.  
**Arctictis**  
*binturong*, 179.  
**Arctocephalus**  
*cinereus*, 188, 190, 191, 196.  
**Ardea**  
*sumatrana*, 434.  
**Artamides**  
*unimodus*, 432.
- Artamus**  
*leucogaster*, 427, 428, 432, 578.  
*musschenbroeckii*, 427, 432, 577, 578.  
**Artaxa**  
*pygmæa*, 515.  
**Arvicola**  
*arvalis*, 97.  
*incertus*, 100.  
*subterraneus*, 97.  
**Asinus**  
*tæniopus*, 541, 542.  
**Aspongopus**  
*viduatus*, 461.  
**Assiminea**  
*gallica*, 128, 129.  
*obeliscus*, 128.  
**Astarte**  
*sulcata*, 145.  
**Asterias**  
*dorsata*, 77.  
*glacialis*, 70.  
*lincki*, 71.  
*nodosa*, 70, 77.  
*reticulata*, 78.  
*stellata*, 77.  
**Astur**  
*alviventris*, 431, 577.  
**Astura**  
*elevialis*, 325.  
**Atella**  
*eurytis*, 222.  
*phalantia*, 505.  
**Aterica**  
*meleagris*, 223.  
**Athoracophorus**  
*bitentaculatus*, 263.  
*virgatus*, 263, 281.  
**Atretia**  
*gnomon*, 142.  
**Atticora**  
*murina*, 287.  
**Aulacorhamphus**  
*hematopygius*, 308.  
**Auricula**  
*acicula*, 362.  
*costellata*, 359.  
**Automolus**  
*holostictus*, 299.  
*striatidorsus*, 299.  
*ignobilis*, 300.  
**Avahis**  
*laniger*, 398.  
**Axinus**  
*croulinensis*, 144.  
*cycladius*, 144.  
*ferruginosus*, 144.  
*flexuosus*, var. *polygona*, 144.  
*subovatus*, 144.
- Azanus**  
*amarah*, 483.  
*sigillata*, 483.  
*ubaldus*, 483.  
*zena*, 483, 507.  
**Azazia**  
*rubicans*, 522.  
**Azeta**  
*mirzah*, 324.
- Babirussa**  
*alfurus*, 55.  
**Baleniceps**  
*rex*, 543.  
**Balcis**  
*arcuata*, 367.  
**Balea**  
*tristensis*, 279.  
*ventricosa*, 278.  
*(Tristania) tristensis*, 279.  
*(—) ventricosa*, 278.  
**Balistes**  
*capricus*, 478.  
**Barlecia**  
*rubra*, 129.  
**Basileuterus**  
*coronatus*, 286.  
*fraseri*, 286.  
*nigricristatus*, 286.  
*tristriatus*, 286.  
**Basiothea**  
*idricus*, 494.  
**Bathynomus**  
*giganteus*, 339.  
**Batissa**  
*tenebrosa*, 270.  
**Batocera**  
*rubus*, 218.  
**Baza**  
*suberistata*, 426, 431.  
**Beleonis**  
*boguensis*, 492.  
*elisa*, 492.  
*johannæ*, 492.  
*leucogyne*, 492.  
*lordaca*, 491.  
*severina*, 492.  
**Bendis**  
*poaphiloides*, 323.  
**Bibos**  
*frontalis*, 400.  
**Bison**  
*americanus*, 400.  
**Bithynia**  
*rubens*, 129.  
**Blennius**  
*lampretæformis*, 446.  
**Bœoula**  
*cupentina*, 322.

- Bolina**  
*bistriga*, 323.  
*fasciolaris*, 323.
- Bombinator**  
*igneus*, 422, 424.
- Bos**  
*indicus*, 400.
- Boselaphus**  
*caama*, 539.
- Bostrichus**  
*aqualis*, 215, 219.
- Botaurus**  
*stellaris*, 552.
- Botrys**  
*abstrusalis*, 525.  
*agavealis*, 325.  
*albidalis*, 501.  
*campalis*, 325.  
*catalaunalis*, 501.  
*eurytalis*, 325.  
*graphitalis*, 326.  
*incalis*, 325.  
*ispasalis*, 525.  
*nitetisalis*, 501.  
*adipodalis*, 325, 525.  
*togatis*, 325.  
*venosalis*, 501.
- Bourcieria**  
*fulgidigula*, 304.
- Brachylia**  
*acronyctoides*, 515.
- Bradymerus**  
*sp.*, 216.
- Buarremon**  
*assimilis*, 291.  
*brunneinuchus*, 292.  
*inornatus*, 291.
- Bubo**  
*leucostictus*, 561.  
*maculosus*, 560, 561.  
*nigrescens*, 309.  
*shellyi*, 561.  
*(Huhua)orientalis*, 558.
- Budorcas**  
*taxicolor*, 477.
- Bufo**  
*concolor*, 424.  
*crucigera*, 424.  
*lineata*, 424.  
*maculata*, 424.  
*melanostictus*, 476.  
*viridis*, 422, 424.  
*vulgaris*, 422, 424.
- Bulimulus**  
*exilis*, 277.
- Bulimus**  
*tarnerianus*, 276.  
*ventrosus*, 277.  
*(Borus) rosaceus*, 280.  
*(Canistrum) fulgetrum*, 260.
- Bulimus**  
*(Corona) melanostoma*, 280.  
*(Leptomerus) tenuissimus*, 280.  
*(Orthostylus) faunus*, 260.
- Buthus**  
*oeruleus*, 207.
- Byssodes**  
*argentata*, 324.
- Byturna**  
*digramma*, 522.
- Cacatua**  
*philippinarum*, 251.  
*sanguinea*, 431.
- Cadulus**  
*cylindratu*, 147.  
*gracilis*, 147.  
*jeffreysi*, 148.  
*olivi*, 147.  
*propinquus*, 147.  
*subfusiformis*, 147.  
*tumidosus*, 148.
- Callianassa**  
*madagassa*, 15.  
*martensi*, 10, 13, 15, 17.  
*mauritiana*, 15, 17.  
*parisiensis*, 15.  
*tridentata*, 13, 14.
- Callidryas**  
*argante*, 317.  
*eubule*, 317.  
*florella*, 226.  
*hyblæa*, 487.  
*pyrene*, 226.  
*thisorella*, 511.  
*trite*, 317.  
*(Catopsilia) florella*, 486.
- Calliste**  
*aurulenta*, 288.  
*lunigera*, 289.  
*nigroviridis*, 289.  
*ruficervix*, 288.  
*venusta*, 289.
- Callithrix**  
*gigot*, 6, 7, 8, 9.  
*moloch*, 7, 8.
- Callopietria**  
*exotica*, 496.  
*yeburii*, 496.
- Callosune**  
*evippe*, 226.
- Calornis**  
*circumscrip*, 429, 430, 433, 577, 579.  
*crassa*, 433.
- Calornis**  
*gularis*, 429, 430, 433, 579.  
*inornata*, 579.  
*metallica*, 429, 430, 433, 579.  
*purpurascens*, 430.  
*purpureiceps*, 430, 579.  
*viridescens*, 430.
- Campephilus**  
*pollens*, 307.  
*solateri*, 307.
- Campylorhynchus**  
*balteatus*, 282.
- Cancer**  
*niger*, 11.
- Capra**  
*agagrus*, 326.  
*megaceros*, 46.
- Capreolus**  
*capræa*, 152.
- Capromys**  
*brachyurus*, 234, 235, 236.  
*melanurus*, 233, 234, 235, 236, 247, 250.  
*pilorides*, 234, 235, 236, 338, 247, 250.  
*prehensilis*, 234, 235, 236.
- Caradrina**  
*insignata*, 516.  
*sabulosa*, 516, 529.  
*venosa*, 516.
- Cardita**  
*aculeata*, 145.
- Cardium**  
*aculeatum*, 145.  
*fasciatum*, 145.  
*papillosum*, 145.
- Carenochrous**  
*comptus*, 292.  
*leucopterus*, 292.  
*spodionotus*, 292.
- Carpophaga**  
*concinna*, 433.  
*rosacea*, 433.
- Cataclysta**  
*principalis*, 325.
- Catamblyrhynchus**  
*diadema*, 293.
- Catamenia**  
*analoides*, 293.  
*homochroa*, 293.  
*inornata*, 293.
- Catascopus**  
*amænus*, 213.
- Catharus**  
*dryas*, 283.  
*fuscater*, 283.

- Catochrysops*  
*asopus*, 483.  
*ella*, 506.  
*cnejus*, 506.  
*contracta*, 506.  
*Catopsilia*  
*aleurona*, 485, 486,  
 487.  
*crocale*, 511.  
*florella*, 485, 486, 487.  
*gnoma*, 486.  
*hyblea*, 487.  
*philippina*, 511.  
*pyranthe*, 511.  
*pyrene*, 485, 486, 487.  
*rufo-sparsa*, 485, 486.  
*thisorella*, 511.  
*Celena*  
*sp. ?*, 323.  
*inclinata*, 323.  
*semifurca*, 323.  
*tepens*, 323.  
*Cephalopterus*  
*penduliger*, 282, 298.  
*Cephanodes*  
*hylas*, 514.  
*Ceratobatrachus*, n. g.,  
 212.  
*guentheri*, 212.  
*Cerehneis*  
*moluccensis*, 431.  
*Cercolabes*  
*prehensilis*, 237.  
*Cercopithecus*  
*erythrotis*, 176.  
*martini*, 176.  
*petaurista*, 176.  
*Ceriornis*  
*blythi*, 477.  
*Certhia*  
*spilonota*, 415.  
*Cervus*  
*mericanus*, 4.  
*sika*, 209.  
*Chabora*  
*undulifera*, 324.  
*Charocampa*  
*celeris*, 494, 513.  
*elpenor*, 514.  
*nessus*, 514.  
*oldenlandia*, 514.  
*tersa*, 321.  
*Chaetocercus*  
*bombus*, 306.  
*Chalciope*  
*deltifera*, 229.  
*Chaleophaps*  
*chrysocolora*, 433.  
*Chamaepetes*  
*goudoti*, 282, 312.  
*tschudi*, 312.  
*Charadrius*  
*fulvus*, 433.  
*Charaxes*  
*epijasius*, 223.  
*Chelys*  
*matamata*, 206.  
*Chemnizia*  
*areolata*, 354.  
*costaria*, 357.  
*densicostata*, 356.  
*gracilis*, 359.  
*gulsona*, 344.  
*nivea*, 357.  
*obliquata*, 358.  
*pallida*, 357.  
*pusilla*, 358.  
*terebellum*, 353.  
*Ohen*  
*carulescens*, 476.  
*Ohilades*  
*putli*, 507.  
*Ohilina*  
*patagonica*, 281.  
*Ohiton*  
*alveolus*, 148.  
*Chloridea*  
*rhexia*, 323.  
*Ohlorodius*  
*niger*, 10, 11.  
*rufescens*, 11.  
*Ohloronerpes*  
*fumigatus*, 282, 307.  
*malherbii*, 307.  
*Chlorospingus*  
*melanotis*, 291.  
*nigrifrons*, 220.  
*ochraceus*, 291.  
*phaeocephalus*, 290.  
*Ohlorostilbon*  
*melanorhynchum*, 306.  
*Chrysomitris*  
*capitalis*, 294, 313.  
*icterica*, 313.  
*olivacea*, 313.  
*siemiradskii*, 282,  
 313.  
*Ohrysotis*  
*erythrura*, 562.  
*Ciconia*  
*nigra*, 552.  
*Cidaria*  
*sp. ?*, 324.  
*Cigaritis*  
*amine*, 224.  
*Cimex*  
*marginella*, 459.  
 (Afrius) *purpureus*,  
 459.  
*Cingula*  
*aculeus*, 123.  
*arenaria*, 124.  
*Cionisus*  
*gracilis*, 341.  
*unicus*, 341.  
*striatus*, 342.  
*Ciroe*  
*minima*, 145.  
*Circulus*  
*striatus*, 359.  
*Cirrædia*  
*edentata*, 497.  
*variolora*, 497.  
*Cistothorus*  
*brunneiceps*, 285.  
*Cithna*  
*carinata*, 149.  
*tenella*, 149.  
 —, var. *costulata*, 149.  
*Colenis*  
*cillene*, 315.  
*Colias*  
*pyrene*, 226, 487.  
*Colius*  
*erythromelon*, 475.  
*nigricollis*, 530.  
*Collocalia*  
*fuciphaga*, 532.  
*Coluber*  
*constrictor*, 475.  
*Columba*  
*albilinea*, 311.  
*Composia*  
*subcyanæa*, 322.  
*Compsocoma*  
*sumptuosa cyanoptera*,  
 289.  
*Conilera*  
*cylindracea*, 44.  
*Conirostrum*  
*albifrons*, 288.  
*atrocyaneum*, 288.  
*fraseri*, 288.  
*Contopus*  
*ardesiacus*, 297.  
*richardsoni*, 297.  
*Coptops*  
*fusca*, 219.  
*Coracopsis*  
*vasa*, 410, 562.  
*Corbicula*  
*minor*, 272.  
*Cornufer*  
*guppyi*, 211.  
*solomonis*, 212.  
*Corvus*  
*capellanus*, 475.  
*latirostris*, 580.  
*orræ*, 580.  
*validissimus*, 433, 577,  
 580.  
*Corydalis*  
*asiatica*, 110.

- Cosmophila*  
*auragoides*, 497.  
*indica*, 497.  
*xanthindyma*, 497.  
*Cosmosoma*  
*auge*, 322.  
*Cotylophus*, 154.  
*Cotylopus*  
*parvipinnis*, 170.  
*Crambus*  
*sp. ?*, 326.  
*decolorellus*, 528.  
*zonellus*, 528, 529.  
*Crania*  
*anomala*, 142.  
*Crateropus*  
*melodus*, 232.  
*Crypturus*  
*transfasciatus*, 282,  
 312.  
*Cucuma*  
*leucogaster*, 431.  
*(Haliaetus) leucogaster*,  
 426.  
*Cucumaria*  
*frondosa*, 254.  
*niger*, 373.  
*Curruca*  
*abyssinica*, 231.  
*Cyanocitta*  
*turcosa*, 294.  
*Cyanocorax*  
*turcosa*, 283.  
*Cyclostoma*  
*infans*, 266, 281.  
*pygmeum*, 266.  
*Cyclotrema*  
*bithynoides*, 148.  
*spheroides*, 148.  
*trochoides*, 148.  
*Cyclotus*  
*potrievii*, 266.  
*Cydosia*  
*nobililella*, 326.  
*Cygnus*  
*nigricollis*, 390.  
*Cylogramma*  
*latona*, 498.  
*Cynanthus*  
*cyanurus*, 282.  
*— celestis*, 305.  
*Cyphogastra*  
*angulicollis*, 213,  
 215.  
*splendens*, 213, 215,  
 219.  
*Dacrydium*  
*vitreum*, 143.  
*Dalsira*  
*affinis*, 461.  
*Dalsira*  
*modesta*, 461.  
*Damalis*  
*capensis*, 48.  
*Danais*  
*alcippus*, 220.  
*chrysippus*, 220.  
*plexippus*, 315.  
*Daphnis*  
*nerii*, 494, 513.  
*Dasychira*  
*crausis*, 228, 229.  
*gentilis*, 228.  
*Dasyurus*  
*maculatus*, 407.  
*Decipula*  
*ovata*, 144.  
*Deilephila*  
*livornica*, 494, 513.  
*Deiopeia*  
*lotrix*, 514.  
*ornatrix*, 322.  
*pulchella*, 227, 495, 514.  
*thyter*, 515.  
*Demigretta*  
*sacra*, 434.  
*Dendrocolaptes*  
*validus*, 301.  
*Dendrocoryna*  
*guttata*, 434.  
*Dendroeca*  
*blackburnia*, 286.  
*Dendrolagus*  
*lumholzi*, 387, 388,  
 407, 408.  
*Dentalium*  
*abyssorum*, 147.  
*agile*, 147.  
*candidum*, 147.  
*capillosum*, 147.  
*dentalis*, 147.  
*entalis*, 147.  
*filum*, 147.  
*panormitanum*, 147.  
*striolatum*, 147.  
*Desmia*  
*sp. inc.*, 229.  
*afflictalis*, 500.  
*Deudorix*  
*sp. ?*, 225.  
*livia*, 485.  
*Diadema*  
*antheon*, 223.  
*bolina*, 223, 316.  
*missippus*, 222.  
*Diaphtes*, n. g., 213.  
*rugosus*, 213, 214, 219.  
*Diasemia*  
*geometralis*, 524.  
*Diatomocephala*  
*pachymera*, 217.  
*Dicæum*  
*fulgidum*, 432.  
*Dicruropsis*  
*bracteata*, 577.  
*bracteatus*, 432.  
*Didonis*  
*biblis*, 316.  
*Diglossa*  
*albilateralis*, 287.  
*aterrima*, 287.  
*personata*, 287.  
*Dilophonota*  
*ello*, 321.  
*meriana*, 321.  
*Dinornis*  
*elephantopus*, 176.  
*Diphlogena*  
*hesperus*, 303.  
*Dipodillus*  
*campestris*, 97.  
*simoni*, 97, 100, 102,  
 103, 104, 105, 106,  
 109.  
*Dipsas*  
*antalus*, 485.  
*Dipus*  
*egyptius*, 101.  
*gerbillus*, 88.  
*hirtipes*, 101.  
*indicus*, 88.  
*Discina*  
*atlantica*, 142.  
*DiscoGLOSSUS*  
*ocellata*, 424.  
*pictus*, 422, 424.  
*sardus*, 422, 424.  
*vittata*, 424.  
*Docimastes*  
*ensiferus schliephackei*,  
 304.  
*Drepanorhynchus*  
*reichenowi*, 556.  
*Drymophila*  
*abyssinica*, 231.  
*Dubusia*  
*taniata*, 289.  
*Dynomene*  
*hispida*, 10, 13.  
*prædator*, 13.  
*Dysdercus*  
*superstitiosus*, 461.  
*Dysithamnus*  
*semicinereus*, 302.  
*unicolor*, 301.  
*Earias*  
*frondosana*, 528.  
*tristrigosa*, 528.  
*Ebulea*  
*catalaunalis*, 501,  
 525.

- Echinanthus**  
*tumidus*, 40.  
**Echinolampas**  
*depressa*, 43.  
*testudinarius*, 41, 42.  
**Eclectus**  
*riedelii*, 431.  
**Ecpantheria**  
*eridane*, 322.  
**Eglisia**  
*macandreae*, 364.  
**Elainea**  
*albiceps*, 296.  
*griseigularis*, 296.  
*modesta*, 296.  
**Elaphis**  
*quadrivirgata*, 475.  
**Emarginula**  
*multistriata*, 148.  
**Ennychia**  
*arabica*, 500.  
**Enyo**  
*lugubris*, 321.  
**Eos**  
*reticulata*, 431.  
**Ephyrodes**  
*postica*, 323.  
**Epimecia**  
*enigma*, 229.  
**Epione**  
*sp. ?*, 324.  
**Equus**  
*africanus*, 542.  
*asinus*, 541, 542.  
— *africanus*, 542.  
— *somalicus*, 476, 540, 542.  
*teniopus*, 541.  
**Erastria**  
*futilis*, 517, 529.  
*scitula*, 517.  
*stigmatula*, 495.  
**Erebus**  
*odora*, 323.  
**Ereta**  
*tipulalis*, 325.  
**Erethizon**  
*dorsatus*, 237, 243, 250.  
**Erinaceus**  
*albiventris*, 402, 403.  
*diadematus*, 402, 403.  
*europaeus*, 402.  
**Eriocnemis**  
*luciani*, 303.  
**Eronia**  
*arabica*, 493.  
*buquetii*, var. *arabica*, 492.  
*capensis*, 493.  
*mosambicensis*, 493.  
**Erosia**  
*sp. ?*, 324.  
*hyperbolica*, 528, 529.  
**Erythrina**  
*indica*, 513.  
**Erythrura**  
*trichroa*, 433.  
**Estheria**  
*melitensis*, 251.  
**Eucereon**  
*imriei*, 320, 322.  
**Euchromia**  
*polymena*, 514.  
**Eudamus**  
*santiago*, 318.  
**Eudiotis**  
*indica*, 501.  
**Eulima**  
*abbreviata*, 370, 372.  
*bilineata*, 365, 366.  
*brevis*, 368.  
*bulimus*, 349.  
*chaunax*, 369.  
*cingulata*, 117.  
*distorta*, 367, 368, 369.  
—, var. *gracilis*, 367.  
*elegantissima*, 358.  
*fusco-apicata*, 369, 370, 372.  
*glabella*, 368.  
*glabra*, 367, 371, 372.  
*hians*, 369.  
*intermedia*, 366.  
*jeffreysiana*, 366.  
*lineata*, 366.  
*minuta*, 370, 372.  
*monodon*, 347.  
*nitida*, 367.  
*obtusa*, 370, 371, 372.  
*petitiana*, 368.  
*philippii*, 367.  
*piriformis*, 369, 372.  
—, var. *bizonata*, 369.  
*polita*, 358, 366, 367.  
*solida*, 368, 372.  
*stalioti*, 368, 371, 372.  
*stenostoma*, 371.  
*subulata*, 365, 366.  
—, var. *nana*, 365.  
—, var. *pallidula*, 365.  
*subumbilicata*, 370, 372.  
*unifasciata*, 351.  
**Eulimella**  
*compactilis*, 362.  
*gracilis*, 363.  
*smithii*, 351.  
**Euotaria**  
*cinerea*, 196.  
*schisthyperöes*, 194.  
**Euphonia**  
*nigricollis*, 288.  
*saturata*, 288.  
*xanthogastra*, 288.  
**Euploea**  
*dorippus*, 481, 504.  
**Euproctus**  
*montanus*, 422, 423.  
*rusconi*, 422.  
**Eurynorhynchus**  
*pygmaeus*, 410.  
**Eurystomus**  
*pacificus*, 426, 433.  
**Eutelia**  
*discistriga*, 497.  
**Euthisanotia**  
*timais*, 322.  
**Falco**  
*sparverius*, 45.  
**Felis**  
*lanea*, 476.  
**Fidonia**  
*albofascia*, 527, 529.  
**Formicivora**  
*caloptera*, 295.  
*caudata*, 302.  
**Francolinus**  
*kirki*, 389.  
*rubricollis*, 389.  
**Gallinago**  
*nobilis*, 313.  
**Gazella**  
*cuvieri*, 538.  
*dama*, 542.  
*sæmmerringi*, 542.  
*spekii*, 538, 540.  
*walleri*, 539, 540, 541, 542.  
**Gegania**  
*pinguis*, 365.  
**Gegenes**  
*karsana*, 493.  
**Geocichla**  
*sp. inc.*, 433.  
*machiki*, 426, 433.  
**Geoffroi**  
*aruensis*, 578.  
*keiensis*, 426, 427, 431, 578.  
*timorlaensis*, 427, 431, 577, 578.  
**Geopelia**  
*mauvei*, 433.  
**Geothlypis**  
*semiflava*, 287.  
**Geotrygon**  
*bourcieri*, 312.

- Gerbillus**  
*erythrurus*, 88.  
*gætulus*, 88.  
**Gerygone**  
*dorsalis*, 432.  
**Glyphodes**  
*sibillalis*, 325.  
*univocalis*, 525.  
**Glyphorhynchus**  
*cuneatus castelnaudi*, 300.  
**Gnathocera**  
*afzeli*, 405, 406.  
*sericinitens*, 405.  
**Gobius**  
*lagocephalus*, 161.  
*plumieri*, 156.  
**Godara**  
*comalis*, 525.  
*incomalis*, 525.  
**Gomalia**  
*albofasciata*, 513.  
*litoralis*, 513, 529.  
**Gomena**  
*subnotata*, 515.  
**Goniaster**  
*obtusangulus*, 62.  
**Goniloba**  
*mercurius*, 318.  
**Gonitis**  
*fractifera*, 497, 498.  
*involuta*, 519.  
*propinqua*, 497.  
*subulifera*, 497.  
**Gonodactylus**  
*bradyi*, 16, 17.  
*trachurus*, 10, 16, 17.  
**Gonodonta**  
*nutrix*, 323.  
*teretimacla*, 323.  
**Grallaria**  
*monticola*, 302.  
*regulus*, 302.  
*ruficapilla*, 302.  
*rufula*, 303.  
**Grammodes**  
*ammonia*, 521.  
*stolida*, 438, 521.  
**Graucalus**  
*melanops*, 432.  
*unimodus*, 432.  
**Gymnura**  
*rafflesi*, 237.  
  
**Haliaetus**  
*leucogaster*, 431.  
*pelagicus*, 409.  
**Haliastur**  
*girrenera*, 431.  
*indus*, 536.
- Hamatumida**  
*dædalus*, 223.  
**Hamodes**  
*aurantica*, 520.  
**Hapalemur**  
*griseus*, 391, 392, 393, 394, 396, 399.  
*olivaceus*, 391.  
*simus*, 391, 392, 394, 399.  
**Helicarion**  
*cuvierii*, 272.  
*freycineti*, 272.  
*robustus*, 272.  
**Helicina**  
*beryllina*, 270.  
*convexa*, 277.  
*fulgora*, 271.  
*ida*, 261.  
*modesta*, 267.  
*musiva*, 271.  
*ponsonbyi*, 266, 281.  
*subfusca*, 277.  
*sublevigata*, 268.  
*tectiformis*, 270.  
**Heliconia**  
*charithonia*, 314.  
**Heliochera**  
*rubrocristata*, 298.  
**Heliodoxa**  
*jamesoni*, 304.  
**Heliomaster**  
*albicrissa*, 282.  
**Heliothis**  
*armigera*, 323, 496, 518, 520.  
*peltigera*, 518.  
**Heliothrix**  
*barroti*, 282.  
**Heliotrypha**  
*viola*, 303.  
**Helix**  
*adansoni*, 276.  
*advena*, 276.  
*afra*, 276.  
*apia*, 271.  
*apicina*, 276.  
*arenaria*, 124, 352.  
*aspera*, 276.  
*bermudensis*, 277.  
*bipartita*, 272.  
*bollei*, 276.  
*circumfirmata*, 277.  
*circumsessa*, 276.  
*coma*, 274, 275.  
*conula*, 271.  
*cressida*, 271.  
*eddystonensis*, 264.  
*essellata*, 279.  
*eucharis*, 264.  
*eurydice*, 271.
- Helix**  
*eustoma*, 265.  
*fortunata*, 276.  
*glabriuscula*, 274.  
*helicinoides*, 264.  
*lactea*, 276.  
*lancerottensis*, 276.  
*lenticula*, 276.  
*lineata*, 276.  
*malleata*, 276.  
*microdonta*, 277.  
*novæ-hiberniæ*, 265.  
*pavida*, 276.  
*phalerata*, 276.  
*resupinata*, 348.  
*swainsoni*, 271.  
*tessellata*, 280.  
*vortex*, 277.  
*zelandiæ*, 274.  
*(Albersia) zonulata*, 260.  
*(Amphidoxa) marmorella*, 280.  
*(Camaena) sanziana*, 260.  
*(Chloritis) dentrecasteauxi*, 265, 281.  
*(Fruticicola) similaris*, 276.  
*(Geotrochus) gærtneriana*, 260.  
*(—) labillardierei*, 264, 281.  
*(—) moseleyi*, 263, 281.  
*(—) pileus*, 260.  
*(Helicobulimus) sarcinosa*, 260.  
*(Hemiplecta) cartereti*, 265, 281.  
*(—) infrastriata*, 264, 281.  
*(Hyalinia) exulata*, 278, 281.  
*(Patula) gradata*, 271.  
*(—) hookeri*, 277.  
*(—) stokesi*, 275, 281.  
*(Philina) bigonia*, 260.  
*(Planispira) tortilabia*, 260.  
*(—) zonaria*, 260.  
*(Stepsanoda) quadrata*, 279.  
*(—) selkirkii*, 279, 281.  
*(Thalassia) traversi*, 274, 281.  
*(Trochomorpha) latimarginata*, 270, 271, 281.  
*(Xesta) pfeifferi*, 270.

- Heloderma**  
*suspectum*, 475.
- Hemicorhina**  
*hilaris*, 284.  
*leucophrys*, 284.  
*prostheleuca*, 284.
- Herodias**  
*alba*, 434.  
*torra*, 434.
- Herpestes**  
*macarthiae*, 176.
- Hesperia**  
*amyntas*, 319.  
*anchises*, 493.  
*bevani*, 512.  
*bidulus*, 224.  
*borbonica*, 227.  
*cnejus*, 506.  
*galba*, 512.  
*hippocrates*, 223.  
*karsana*, 493, 512.  
*mathias*, 493, 512.  
*ocula*, 319.  
*plinius*, 506.  
*syriacus*, 319.  
*theophrastus*, 484.
- Hesperomys**  
*albigularis*, 448, 450, 452.  
*angouya*, 448.  
*arenicola*, 456.  
*astecus*, 449.  
*bicolor*, 448.  
*bimaculatus*, 449, 451, 454, 455, 458.  
—, var. *lepidus*, 448, 458.  
*boliviensis*, 449.  
*californicus*, 449.  
*caliginosus*, 456.  
*cinereus*, 449, 450, 458.  
*darwini*, 449.  
*elegans*, 449, 455.  
*galapagoensis*, 448.  
*gracilipes*, 449, 455.  
*griseoflavus*, 449.  
*hispidus*, 450.  
*laticeps*, 452, 453, 458.  
—, var. *nitidus*, 448, 452.  
*latimanus*, 448, 450, 451, 452, 458.  
*leucodactylus*, 448, 452, 458.  
*leucogaster*, 449.  
*leucopus*, 449.  
*longicaudatus*, 448.  
*longipilis*, 450.  
*megalonys*, 456.
- Hesperomys**  
*nasutus*, 450.  
*obscurus*, 456.  
*olivaceus*, 450, 456.  
*palustris*, 234, 448.  
*pilorides*, 450.  
*pyrrhorhinus*, 448, 450.  
*rufus*, 450.  
*scalops*, 450, 456, 458.  
*spinosus*, 448, 458.  
*sumichrasti*, 448.  
*taczanowskii*, 449, 450.  
*tomentosus*, 449.  
*torridus*, 449.  
*tumidus*, 449.  
*vulpinoides*, 452.  
*xanthopygus*, 449, 458.  
*xanthorhinus*, 450, 457.  
*(Calomys) bimaculatus*, 454.  
—, *lepidus*, 454.  
*(Habrothrix) caliginosus*, 456.  
—, *olivaceus*, 456.  
—, *scalops*, 455.  
—, *xanthorhinus*, 457.  
*(Oryzomys) galapagoensis*, 453.  
—, *laticeps*, 452.  
—, *longicaudatus*, 453.  
—, *spinosus*, 453.  
*(Rhipidomys) leucodactylus*, 451.  
*(Vesperimus) cinereus*, 455.
- Heteranax**  
*mundus*, 432.
- Heterochroma**  
*leucographa*, 500.
- Hipparchia**  
*asterope*, 481.
- Hirundo**  
*cinerea*, 287.  
*javanica*, 426, 433.  
*rustica*, 536.
- Holochilus**  
*(Nectomys) apicalis*, 451.
- Holothuria**  
*intestinalis*, 367, 565.  
*nigra*, 372, 373, 374, 375, 376, 563, 564, 565.  
*poli*, 565.  
*tubulosa*, 565.
- Homalogyra**  
*densicostata*, 129.  
*rota*, 130.
- Homo**  
*sapiens*, 533.
- Homoptera**  
 sp. ? , 323.  
*exhausta*, 323.  
*fuliginosa*, 323.  
*lunata*, 323.  
*terrosa*, 323.  
*vetusta*, 520.
- Hoplocephalus**  
*par*, 210.
- Horonotus**  
*deilophus*, 214.
- Huhua**  
*cinerascens*, 560, 561.  
*lactea*, 560.  
*nipalensis*, 558, 559, 560.  
*orientalis*, 560.  
*pectoralis*, 558, 559.  
*poensis*, 560.  
*shellyi*, 561.  
*verreauxi*, 560.
- Hydrilodes**  
*insignis*, 500.
- Hydrobia**  
*auberiana*, 277.  
*barleii*, 128.  
*compacta*, 128, 149.  
*subumbilicata*, 128.  
*ulva*, 128, 129.  
*ventrosa*, 124, 120.
- Hydrocampa**  
*tenera*, 524.
- Hydrochærus**  
*capybara*, 252.
- Hyla**  
*arborea*, 422, 424.  
—, subsp. *savignyi*, 422.  
*fuscomaculata*, 424.  
*intermedia*, 424.  
*savignyi*, 424.
- Hylophilus**  
*aurantiifrons*, 313.  
*minor*, 313.
- Hylpsornis**  
*salvadorii*, 416, 417.
- Hymenia**  
*fascialis*, 229, 325, 500, 524.
- Hymenolæmus**  
*malacorrhynchus*, 389.
- Hypanis**  
*ilihiya*, 222, 433.
- Hypena**  
*abyssinialis*, 499.  
*conscitialis*, 229.  
*echeonalis*, 229.  
*jussalis*, 499.  
*obacerralis*, 499, 500.

- Hyperoodon**  
*latifrons*, 206.  
*rostratus*, 206.  
**Hyperythra**  
*phantasma*, 526.  
*swinhoei*, 526.  
**Hypochroma**  
*dispensata*, 526.  
*pseudo-terpnaria*, 526.  
**Hypolais**  
*icterina*, 477.  
**Hypolimnas**  
*alcippoides*, 482.  
*bolina*, 505.  
*missippus*, 222, 481, 482, 505.  
**Hypotia**  
*rubella*, 523, 529.  
*vafera*, 523, 529.  
*vulgaris*, 523.  
**Hypoxanthus**  
*equatorialis*, 307.  
*brevirostris*, 307.  
*revolvi*, 307.  
— *brevirostris*, 307.  
**Hystrix**  
*cristata*, 237.  
**Idaea**  
*actuaria*, 527.  
*distracta*, 526.  
*inductata*, 527.  
*invalida*, 527.  
*jacta*, 526, 529.  
*remotata*, 526.  
**Idmais**  
*miriam*, 488.  
**Ilattia**  
*cephusalis*, 516.  
**Iodis**  
*sp. ?*, 324.  
*indeclararia*, 324.  
**Iphitus**  
*sp.*, 149.  
**Ismene**  
*alexis*, 512.  
*anchisis*, 493.  
*chromus*, 512.  
**Isocardia**  
*cor*, 145.  
**Jarasana**  
*lativitta*, 517.  
**Juliamyia**  
*feliciana*, 306.  
**Junonia**  
*almana*, 505.  
*asterie*, 505.  
*cenia*, 316.  
*cebrene*, 482.  
**Junonia**  
*clelia*, 222, 482.  
*cebrene*, 482.  
*here*, 482.  
*hierta*, 505.  
*lemonias*, 505.  
*orithyia*, 482, 505.  
**Lacerta**  
*agilis*, 420, 421, 570, 573.  
*ocellata*, 418, 419, 420.  
— *pater*, 419.  
*pater*, 419, 420.  
*schreiberi*, 418, 419, 420.  
*viridis*, 418, 419, 420.  
— *typus*, 419.  
—, var. *gadovii*, 421.  
**Lafresnaya**  
*gayi*, 303.  
**Lagenocetus**  
*latifrons*, 206.  
**Lagoptera**  
*magica*, 520.  
**Lagopus**  
*scoticus*, 45.  
**Lalage**  
*mæsta*, 432.  
**Lampides**  
*contracta*, 506.  
*kandarpa*, 506.  
**Lampropygia**  
*wilsoni*, 304.  
**Laniarius**  
*hypopyrrhus*, 54.  
*lagdeni*, 54.  
*poliocephalus*, 54.  
**Laphygma**  
*caradrinoides*, 495.  
*exigua*, 516.  
**Larus**  
*atricilla*, 150.  
*philadelphia*, 150.  
**Lasea**  
*pumila*, 144.  
**Latia**  
*neritoides*, 274.  
**Leda**  
*arctica*, 143.  
*fragilis*, 143.  
*insculpta*, var. *lævis*, 144.  
*jeffreysi*, 144.  
*messanensis*, 143.  
*micrometrica*, 144.  
*minima*, 144.  
*minuta*, 143.  
*pusio*, 143.  
*striolata*, 143.  
*subæquilatera*, 144.  
**Leiostraca**  
*jeffreysiana*, 366, 372.  
**Lemur**  
*catta*, 398, 399.  
*mayottensis*, 397.  
**Lentipes**, 170.  
*concolor*, 171.  
*seminudus*, 171, 172.  
**Lepetella**  
*tubicola*, 148.  
**Lepidodactylus**  
*guppyi*, 210.  
**Leptaulax**  
*timoriensis*, 214.  
**Leptopoma**  
*melanostoma*, 261.  
*vitreum*, 261.  
**Leptoptila**  
*verreauxi*, 311.  
**Leptoptilus**  
*argala*, 551.  
**Leptosquilla**  
*schmeltzii*, 10, 16.  
**Lesbia**  
*amaryllis*, 305.  
*gouldi gracilis*, 305.  
**Leucania**  
*antica*, 322.  
*extranea*, 495.  
*loreyi*, 516.  
**Leucinodes**  
*orbonalis*, 524.  
**Leucosia**  
*fugax*, 13.  
**Lima**  
*excavata*, 143.  
*gigantea*, 143.  
*hians*, var. *tenera*, 143.  
*loscombii*, 143.  
*sarsii*, 143.  
*subovata*, 143.  
**Limax**  
*canariensis*, 276, 278.  
*capensis*, 276.  
*flavus*, 272.  
*gagates*, 276, 278, 279, 281.  
**Limnæa**  
*pyrifera*, 593.  
**Limnas**  
*sp.*, 481.  
*alcippoides*, 478.  
*alcippus*, 478, 479, 480, 481, 482, 504.  
*chrysippus*, 478, 479, 480, 481, 482, 486, 504, 505.  
*dorippus*, 478, 480, 481, 482, 504, 505.  
*inaria*, 482.  
**Limopsis**  
*aurita*, 144.  
*cristata*, 144.

- Limopsis*  
*minuta*, 144.  
*Liomera*  
*pubescens*, 10.  
*Lioptilus*  
*abyssinicus*, 231.  
*galinieri*, 232.  
*nigricapillus*, 231.  
*olivascens*, 231, 232.  
*Liostomia*  
*eburnea*, 345.  
*Lissocarcinus*  
*orbicularis*, 10, 12.  
*Lithodes*  
*maia*, 329.  
*Lobivanellus*  
*miles*, 433.  
*Loeris*  
*rubra*, 461.  
*Lophotriccus*  
*squamicristatus*, 296.  
*Lophura*  
*nana*, 494.  
*Loris*  
*gracilis*, 398, 399.  
*Lucia*  
*delagorguei*, 224.  
*Lucina*  
*borealis*, 144.  
*spinifera*, 144.  
*Lumpenus*  
*lampetraformis*, 446.  
*lampetriformis*, 445,  
 446.  
*Lurocalis*  
*rufiventris*, 306.  
*Lycæna*  
*acamas*, 507.  
*asopus*, 483.  
*cassius*, 317.  
*delegorguei*, 224.  
*gaika*, 484.  
*hanno*, 316.  
*hippocrates*, 223.  
*kandarpa*, 506.  
*knysna*, 224.  
*lingens*, 224.  
*nara*, 506.  
*parva*, 484.  
*princeps*, 224.  
*pulcher*, 483.  
*pulchra*, 224.  
*pulti*, 507.  
*pygmæa*, 507.  
*theophrastus*, 484.  
*trochilus*, 484.  
*zena*, 483, 507.  
*Lycenesthes*  
*princeps*, 224.  
*Lyonsia*  
*formosa*, 146.  
*Macaria*  
*acidaliata*, 324.  
*æquiferaria*, 324.  
*enotata*, 324.  
*Macahirhamphus*  
*alcinus*, 536.  
*Macroglossa*  
*stellatarum*, 514.  
*Macropygias*  
*sp. inc.*, 433.  
*keiensis*, 433.  
*Magulaba*  
*mæstalis*, 499.  
*Malletia*  
*cuneata*, 144.  
*obtusa*, 144.  
*Mamestra*  
*dubitans*, 495.  
*opposita*, 495.  
*Mareca*  
*capensis*, 174.  
*Margarornia*  
*jairusalis*, 325.  
*transisulcis*, 501.  
*Margarornis*  
*brunnescens*, 300.  
*perlata*, 300.  
*squamigera*, 300.  
*Marimatha*  
*lactea*, 522, 529.  
*Mathilda*  
*quadricarinata*, 364,  
 372.  
*Mecocerculus*  
*calopterus*, 295.  
*pacilocercus*, 295.  
*stictopterus*, 295.  
*Mecyna*  
*deprivalis*, 501.  
*Megalobatrachus*  
*maximus*, 251.  
*Megalomastoma*  
*antillarum*, 277.  
*Megapodius*  
*tenimberensis*, 433.  
*Megerlia*  
*truncata*, 142.  
*Melampus*  
*gundlachi*, 277.  
*Melanchroia*  
*cephise*, 322.  
*Melania*  
*sp. ?*, 262.  
*acicula*, 362.  
*area*, 262.  
*apiensis*, 269, 270, 281.  
*arthurii*, 267.  
*balonnensis*, 272.  
*campanilla*, 357.  
*christobalensis*, 262.  
*distorta*, 367.  
*Melania*  
*figurata*, 269.  
*inhonesta*, 271.  
*lancea*, 272.  
*maviensis*, 275.  
*newcombii*, 275.  
*nitida*, 367.  
*ordinaria*, 270, 281.  
*rufa*, 356.  
*scalaris*, 355.  
*scilla*, 361.  
*scipio*, 269.  
*sobria*, 261.  
*turbans*, 269, 270, 281.  
*Melanitis*  
*ismene*, 481, 504.  
*leda*, 504.  
*Mella*  
*yerburi*, 502.  
*zinckenella*, 502, 529.  
*Menaethius*  
*monoceros*, 10.  
*Meriones*  
*crassus*, 99.  
*erythrurus*, 88, 89, 90,  
 91, 92, 93, 94, 95,  
 96, 97, 98, 99.  
*longifrons*, 88, 89, 90,  
 91, 92, 93, 94, 95,  
 96, 97, 98, 99, 102,  
 103, 104, 106, 107,  
 108, 109.  
*opimus*, 89.  
*shawi*, 89, 91, 92, 93,  
 94, 95, 98, 99, 100,  
 101, 102, 103, 104,  
 105, 107, 108, 109.  
*Mesalia*  
*brevialis*, 131, 132.  
*plicata*, 132.  
*striata*, 132.  
*sulcata*, 132.  
*suturalis*, 131.  
*Metallura*  
*tyrianthina*, 305.  
 — *quitensis*, 305.  
*Metriopelia*  
*melanoptera*, 311.  
*Micra*  
*sp. ?* 323.  
*balux*, 519, 529.  
*chalybea*, 518, 529.  
*derogata*, 518.  
*furia*, 519, 529.  
*Micrastur*  
*guerilla*, 310, 311.  
*pelzelni*, 311.  
*Microcheta*  
*rappi*, 478.  
*Microeca*  
*hemixantha*, 432.

- Microscyidium*, 154.  
*gymnauchen*, 163.  
**Mineta**  
*decipiens*, 432.  
**Miniopterus**  
*australis*, 53.  
*blepotis*, 53.  
*schreibersi*, 53.  
—, var. *blepotis*, 53.  
*tristis*, 53, 54.  
**Mionectes**  
*striaticollis*, 296.  
**Modiolaria**  
*nigra*, 143.  
**Molleria**  
*costulata*, 148.  
*laevigata*, 148.  
**Monachus**  
*albiventer*, 251.  
**Monarcha**  
*castus*, 432.  
*mundus*, 432.  
*nitidus*, 432.  
**Munia**  
*molucca*, 433.  
**Mus**  
*decumanus*, 100,  
101.  
*musculus*, 100, 104.  
*tamaricinus*, 88.  
**Muscicapa**  
*carulescens*, 555.  
*cinerascens*, 555.  
*fuscata*, 230.  
*johnstoni*, 555.  
*minima*, 230.  
*minuta*, 230.  
**Muscisaxicola**  
*maculirostris*, 295.  
**Mya**  
*truncata*, 146.  
**Myana**  
*atromaculata*, 523, 529.  
*sopora*, 522, 529.  
**Mycalasis**  
*desolata*, 220.  
*doleta*, 220.  
*rasaces*, 220.  
*vulgaris*, 220.  
**Myiagra**  
*fulviventeris*, 432.  
**Myiarchus**  
*nigriceps*, 297.  
**Myiobius**  
*crypterythrus*, 297.  
*flavicans*, 297.  
*stellatus*, 282, 297.  
**Myiodynastes**  
*chrysocephalus*, 296.  
**Mylothris**  
*hemitheca*, 317.  
**PROC. ZOO. SOC.—1884, No. XLIII.**
- Myra**  
*fugar*, 10, 13.  
*subgranulata*, 13.  
**Myrina**  
*nomenia*, 224.  
**Myristicivora**  
*bicolor*, 433.  
**Myrmia**  
*micrura*, 282.  
**Myrmotherula**  
*menetriesi*, 302.  
**Myrtis**  
*fanny*, 306.  
**Myzomela**  
*annabella*, 432.  
*wakoloensis*, 429.  
**Nanina**  
*citrina*, 259.  
*perpolita*, 271.  
*longana*, 271.  
**Natica**  
*montacuti*, 122.  
**Navicella**  
*bougainvillei*, 270.  
*freycineti*, 270.  
*macrocephala*, 270.  
**Neera**  
*circinata*, 146.  
*contracta*, 146.  
*curta*, 146.  
*cuspidata*, 146.  
*depressa*, 146.  
*gracilis*, 146.  
*lamellifera*, 146.  
*lamellosa*, 146.  
*limatula*, 146.  
*rostrata*, 146.  
*ruginosa*, 146.  
*semistrigosa*, 146.  
*striata*, 146.  
*subtorta*, 146.  
**Nectarinia**  
*famosa*, 556.  
*kilimensis*, 555, 556.  
*reichenowii*, 556.  
*tacazze*, 555, 556.  
**Nemophas**  
*forbesii*, 213, 218, 219.  
*grayii*, 218.  
**Nemoria**  
*frequens*, 526.  
*pruinosa*, 526.  
**Nemosia**  
*ornata*, 290.  
**Nepheronia**  
*arabica*, 492.  
**Neptis**  
*agatha*, 223.  
*melicerta*, 223.  
**Neptunus**  
*sanguinolentus*, 10.  
**Merita**  
*cariosa*, 275.  
*mauricii*, 275.  
**Meritina**  
*brevispina*, 262.  
*cariosa*, 275.  
*cornea*, 262, 267.  
*porcata*, 270.  
*prichardi*, 270.  
*rubida*, 270.  
*sandalina*, 270.  
*sidera*, 270.  
*smithii*, 275.  
*souverbiana*, 272, 274.  
*variegata*, 262, 270.  
*wallisianum*, 262.  
**Nettapus**  
*pulchellus*, 434.  
**Nidorellia**  
*armata*, 63, 79.  
*melchii*, 79, 81.  
**Ninox**  
*forbesi*, 431.  
**Noctua**  
*frugalis*, 499.  
*stolidia*, 498.  
**Noorda**  
*blitealis*, 501.  
**Nothoprocta**  
*curvirostris*, 312.  
**Nucula**  
*ageensis*, 144.  
*corbuloides*, 144.  
*sulcata*, 144.  
*tumidula*, 144.  
**Numenius**  
*variegatus*, 433.  
**Numida**  
*vulturina*, 477.  
**Nycticebus**  
*tardigradus*, 399.  
**Nycticorax**  
*caledonicus*, 434.  
*griseus*, 2.  
**Nyctidromus**  
*albicollis*, 306.  
**Nyctinomus**  
*albidus*, 50, 51.  
*australis*, 50, 51.  
*brasiliensis*, 49.  
*norfolkensis*, 49.  
*petersi*, 49.  
*plicatus*, 51, 532.  
**Nymphula**  
*interpunctalis*, 525.  
**Obeliscus**  
*sufarcinatus*, 363.  
*tinctus*, 363.  
43

- Oechthodietra fumigatus*, 294.  
*Oechthoea fumicolor*, 295.  
*gratiosa*, 295.  
*lessoni*, 295.  
*Octodon cumingii*, 237.  
*Odontophorus erythrops*, 282.  
*Odontostoma plicatum*, 349.  
*sicula*, 347.  
*Odostomia acicula*, 362.  
—, var. *ventricosa*, 363.  
*acuta*, 347.  
*acuticostata*, 359, 372.  
*albella*, 348.  
*attenuata*, 360, 372.  
*clathrata*, 355.  
*clavula*, 345.  
*compactilis*, 362.  
*compressa*, 360, 361, 372.  
*concinna*, 350.  
*conoidea*, 347, 348, 350, 364.  
*conspicua*, 350.  
*costaria*, 350.  
*crassa*, 350, 372.  
*decussata*, 124, 352.  
*delicata*, 359.  
*densicostata*, 356.  
*diaphana*, 349.  
*edwardsi*, 348.  
*electa*, 345.  
*emaciata*, 353.  
*erjaveciana*, 349.  
*excavata*, 352.  
*eximia*, 352.  
*flexuosa*, 355, 372.  
*fulgidula*, 350, 372.  
*fulvo-cincta*, 356.  
*fusulus*, 349.  
*humboldtii*, 352.  
*indistincta*, 354, 355.  
*insculpta*, 349.  
*interstincta*, 353.  
*jeffreysi*, 353.  
*lutea*, 357, 358, 359.  
*macella*, 351.  
*magnifica*, 357.  
*minuta*, 351.  
*monterosatoi*, 346.  
*moulinsiana*, 353.  
*nagii*, 347.  
*neglecta*, 350.  
*nisoidea*, 343.  
*nitens*, 349, 372.  
*novegrazensis*, 348.  
*Odostomia pallida*, 348.  
*paucistriata*, 361, 372.  
*penchinati*, 353.  
*pistilliformis*, 345.  
*pistillus*, 345.  
*plcata*, 349.  
*praelonga*, 350, 372.  
*pusilla*, 358.  
*rissoides*, 348.  
*rufa*, 356.  
*scalaris*, 348, 355, 356.  
*soilla*, 350, 361.  
*semicostata*, 361, 372.  
*sigmoidea*, 354, 372.  
*sinuosa*, 358, 372.  
*sismonda*, 347.  
*spiralis*, 352.  
*striatula*, 356.  
*suboblonga*, 345.  
*suturalis*, 353.  
*sylvestris*, 353.  
*tenuis*, 347, 350.  
*terebellum*, 353.  
*tricineta*, 351.  
*turriculata*, 346.  
*turrita*, 346.  
*unidentata*, 346.  
*unifasciata*, 351, 372.  
*ventricosa*, 363.  
*vitrea*, 349, 350.  
*(Eulimella) superflua*, 362.  
*(Pyrgulina) nanodea*, 354.  
*(Syrnola) minuta*, 349.  
*Oligostigma incommoda*, 524.  
*Omphalotropis variabilis*, 271.  
*Onychopriion anæsthetus*, 434.  
*Opatrum* sp., 216.  
*micans*, 216.  
*Ophideres apta*, 323.  
*materna*, 229, 498.  
*Ophiocardelus australis*, 272.  
*Ophiodes seperans*, 521.  
*tumidilinea*, 521.  
*Ophiusa anfractuosa*, 499.  
*albivitta*, 521.  
*narrans*, 323.  
*Oræsia* sp. ?, 228.  
*alliciens*, 228.  
*vagabunda*, 519, 529.  
*Oreaster aculeatus*, 62, 78.  
*affinis*, 61, 64, 87.  
*alveolatus*, 59, 61, 64, 73, 80.  
*armatus*, 59, 61, 64, 79, 80.  
*australis*, 61, 64, 65.  
*carinatus*, 62, 87.  
*chinensis*, 62, 64, 68, 69, 70.  
*clavatus*, 62, 77.  
*clouet*, 62.  
*decipiens*, 64, 69.  
*dorsatus*, 62, 64, 77, 87.  
*forcipulosus*, 62, 64, 65.  
*franklini*, 62.  
*gigas*, 62, 78.  
*gracilis*, 62, 65, 80, 82, 83.  
*granulosus*, 62, 64, 67, 80.  
*grayi*, 64, 83.  
*hedemanni*, 62, 64, 71.  
*hiulcus*, 62, 64, 71.  
*lapidarius*, 62, 79.  
*lincki*, 59, 62, 64, 70, 71, 73, 87.  
*luetkeni*, 64, 75.  
*mammillatus*, 62, 64, 67.  
*mammosus*, 62.  
*micellini*, 62.  
*muelleri*, 64, 86.  
*muricatus*, 62.  
*nodosus*, 59, 62, 63, 64, 70, 73.  
*nodulosus*, 59, 60, 62, 64, 66.  
*obtusangulus*, 62.  
*obtusatus*, 63.  
*occidentalis*, 60, 61, 62, 64, 76.  
*orientalis*, 62, 65, 84, 85, 86.  
*productus*, 64, 74, 87.  
*regulus*, 62.  
*reinhardtii*, 62, 64, 74.  
*reticulatus*, 62, 64, 75, 78, 84, 87.  
*seba*, 62.  
*superbus*, 62, 65, 81.  
*trocheli*, 64, 85.  
*tuberculatus*, 62.  
*tuberosus*, 78.  
*turritus*, 62.  
*valvulatus*, 62, 64, 67.  
*verrucosus*, 62.  
*westermanni*, 62, 65, 81.

- Oriolus*  
*decepiens*, 432.  
*Ornithion*  
*solateri*, 296.  
*Ornithoscatoidea*, n. g.,  
 198.  
*ceylonica*, 201, 202,  
 203, 205.  
*decepiens*, 199, 200,  
 205.  
*nigra*, 202, 205.  
*tuberosa*, 200, 205.  
*Orthorhamphus*  
*magnirostris*, 433.  
*Orthorhynchus*  
*latus*, 217.  
*Orthosia*  
*infrequens*, 517, 529.  
*Oryctes*  
*rhinoceros*, 214.  
*Oryx*  
*beisa*, 48.  
*Ostinops*  
*atrocastaneus*, 294.  
*Otaria*  
*albicollis*, 194.  
*australis*, 194.  
*cinerea*, 188, 189, 190,  
 191, 192, 193, 194,  
 195.  
*forsteri*, 196.  
*pusilla*, 194, 475.  
*ursina*, 195.  
*Othora*  
*ænea*, 520, 529.  
*Ovis*  
*gmellini*, 595, 596.  
*karelini*, 326, 327, 329.  
*musimon*, var. *occiden-*  
*talis*, 595.  
 —, var. *orientalis*, 595.  
*ophion*, 594, 595, 596.  
*poli*, 326, 327, 328, 329.  
*Pachnoda*  
*marginata*, 406.  
 —, var. *aurata*, 406.  
*Pachycephala*  
*arctitorquis*, 428, 429,  
 432, 578.  
*fusco-flava*, 432.  
*kibirensis*, 428, 429,  
 432.  
*riedelii*, 428, 432, 578.  
*Pachydissus*  
*holosericeus*, 217.  
*Pachygastrina*  
*niris*, 228, 229.  
*reducta*, 228.  
*Pachyliu*  
*ficus*, 321.  
*Pachyrhamphus*  
*versicolor*, 298.  
*Pachyuromys*  
*duprasi*, 101, 104, 108.  
*Pædisca*  
*decolorana*, 528.  
*Palæolampas*  
*crassa*, 42.  
*Palindia*  
*juncida*, 323.  
*Paludina*  
*benzi*, 119.  
*rubens*, 129.  
*Pamphila*  
*bevani*, 512.  
*borbonica*, 227.  
*bucephalus*, 319, 320.  
*ethlius*, 319.  
*hala*, 319, 320.  
*karsana*, 512.  
*mathias*, 512.  
*ocola*, 319.  
*phyleus*, 319.  
*ravola*, 320.  
*vitellius*, 320.  
*Pandesma*  
*devia*, 520, 529.  
*fugitiva*, 519.  
*quenavadi*, 498.  
*similata*, 520.  
*Pandion*  
*leucocephalus*, 431.  
*Panopea*  
*plicata*, 147.  
*Panoplites*  
*mathewsi*, 304.  
*Papilio*  
*agatha*, 223.  
*agave*, 317.  
*alcesta*, 225.  
*alcippus*, 220, 481,  
 504.  
*alexis*, 512.  
*almana*, 505.  
*anaphus*, 319.  
*argante*, 317.  
*asterie*, 505.  
*baticus*, 483, 505.  
*biblis*, 316.  
*bolina*, 316, 505.  
*brigitta*, 225.  
*cæcilia*, 221.  
*calaia*, 487.  
*calypso*, 225.  
*cardui*, 505.  
*cassius*, 317.  
*chloris*, 225.  
*chrysippus*, 480, 504.  
*chromus*, 512.  
*cillene*, 315.  
*clelia*, 222, 482.  
*Papilio*  
*crema*, 225.  
*crocale*, 511.  
*dædalus*, 223.  
*demoleus*, 226.  
*egina*, 221.  
*elorea*, 224.  
*ethlius*, 319.  
*eubule*, 317.  
*evippe*, 226.  
*fausta*, 508.  
*florella*, 486.  
*genutia*, 504.  
*hanno*, 316.  
*hecabe*, 507.  
*hierta*, 505.  
*hippocoon*, 226.  
*hippocrates*, 223.  
*homerus*, 314.  
*iatrophe*, 316.  
*ilithya*, 222, 483.  
*ismene*, 504.  
*leda*, 504.  
*lemonia*, 505.  
*limniace*, 503.  
*lingens*, 224.  
*meleagris*, 223.  
*merope*, 226.  
*mesentina*, 511.  
*misippus*, 222, 481,  
 505.  
*neodamas*, 315, 318.  
*orithya*, 505.  
*phalanta*, 505.  
*philippina*, 511.  
*phyleus*, 319.  
*plexippus*, 315.  
*polydomas*, 318.  
*proteus*, 318.  
*pylades*, 226.  
*pyranthe*, 511.  
*saba*, 226.  
*serena*, 222.  
*sophia*, 222.  
*terea*, 222.  
*trite*, 317.  
*vanilla*, 315.  
*vinder*, 227.  
*zeuxippe*, 511.  
 (Laertias) *pammon*,  
 512.  
 (Menelaides) *diphilus*,  
 512.  
 (Opheides) *erithonius*,  
 512.  
*Paradisea*  
*minor*, 251.  
*Paraponyx*  
*affinialis*, 524.  
*Parasa*  
*sp. ?*, 228.

- Parisoma**  
*frontale*, 232.  
*galinieri*, 232.  
*olivascens*, 232.  
**Parmacochles**, n. g., 273.  
*fischeri*, 272, 273, 281.  
**Parmarion**  
*extraneus*, 273.  
**Parnara**  
*mathias*, 493.  
**Parthenia**  
*varicosa*, 357.  
*ventricosa*, 363.  
**Partula**  
 sp., 271.  
*elongata*, 266.  
*gracilis*, 266.  
*hartmanni*, 265  
 281.  
*minuta*, 266.  
**Parula**  
*inornata*, 286.  
*pitiayumi*, 286.  
 — *pacifica*, 286.  
**Paulia**  
*horrida*, 62, 63.  
**Peechhiolia**  
*acuticostata*, 146,  
 364.  
*angulata*, 146.  
*insculpta*, 146.  
*subquadrata*, 146.  
**Pecten**  
*maximus*, 349.  
*opercularis*, 349.  
*pes-felis*, 143.  
*philippii*, 143.  
*pugio*, 142.  
*similis*, 143.  
*testa*, 143.  
*vitreus*, 143.  
**Pediris**  
*sulciger*, 216, 217.  
*subopacus*, 216.  
 (Nycobates) *sulciger*,  
 216.  
**Pelagoderus**  
*arouensis*, 218.  
*rugosus*, 213, 218.  
**Pelecanus**  
*trachyrhynchus*, 410.  
**Pelobates**  
*fuscus*, 422, 424.  
**Pempelia**  
*cautella*, 529.  
*ilella*, 529.  
**Penæus**  
*monodon*, 10, 15.  
**Penelope**  
*montagnii*, 283, 312.  
*ortoni*, 282.  
**Pentaceros**  
*alveolatus*, 73.  
*chinensis*, 68.  
*dorsatus*, 77.  
*granulosus*, 67.  
*muricatus*, 71.  
*nodosa*, 83.  
*nodulosus*, 66.  
*reticulatus*, 78.  
*turritus*, 70.  
 (Nidorellia) *armata*,  
 79.  
**Perigea**  
*inexacta*, 495.  
**Persephone**  
*rufilabris*, 118.  
**Petasophora**  
*ancis*, 303.  
*cyanotis*, 303.  
**Petromyzon**  
*branchialis*, 582.  
**Phæolema**  
*æquatorialis*, 303.  
**Phaethornis**  
*syrrhatophorus*, 303.  
**Phakellura**  
*immaculalis*, 325.  
*indica*, 501, 525.  
*marginalis*, 325.  
**Phalacrocorax**  
*africanus*, 55.  
**Phalæna-Noctua**  
*latona*, 498.  
*materna*, 498.  
**Phalæna-Pyralis**  
*fascialis*, 500.  
**Phalangista**  
*albertisii*, 381, 382.  
*archeri*, 381, 382, 383,  
 407.  
*herbertensis*, 384, 407.  
*lemuroides*, 386, 387,  
 407.  
*viverrino*, 385.  
 (Hemibelideus) *lemu-*  
*roides*, 385.  
 (Pseudochirus) *archeri*,  
 381.  
**Pharomacrus**  
*antistensis*, 308.  
*auriceps heliactin*,  
 308.  
**Phasianella**  
*pulla*, 149.  
**Phelsuma**  
*cepedianum*, 2.  
*newtoni*, 2.  
**Phemidias**  
*augias*, 319.  
**Pherusa**  
*gu'sonæ*, 344.  
**Pheuticus**  
*chrysogaster*, 292.  
**Philampelus**  
*labrusca*, 321.  
*linnei*, 321.  
**Philemon**  
*plumigenis*, 429, 432,  
 579.  
*timorlaensis*, 429, 577,  
 579.  
*timorlautensis*, 432,  
 579.  
**Philomycus**  
*bilineatus*, 259.  
**Phylxia**  
*erosa*, 10, 13.  
**Phoca**  
*cinerea*, 195.  
**Phæoptera**  
 sp. ?, 322.  
*cornea*, 322.  
**Phœnicothraupis**  
*stolzmanni*, 313.  
**Pholas**  
*candida*, 147.  
**Phragmataecia**  
*fæda*, 515, 529.  
**Phrygilus**  
*alaudinus*, 294.  
*plebeius*, 294.  
**Phurys**  
*garnoti*, 324.  
*helvina*, 324.  
*immunis*, 324.  
*optabilis*, 324.  
**Phyllocharis**  
*cyanipes*, 219.  
**Physa**  
 sp. ?, 272.  
*rivalis*, 277.  
*sinuata*, 271.  
**Piaya**  
*cayana mesura*, 308.  
**Picolaptes**  
*lacrymiger warszewiezi*,  
 301.  
**Picumnus**  
*olivaceus*, 282.  
*sclateri*, 282.  
**Picus**  
*major palzami*, 400.  
**Pieris**  
*calypso*, 225.  
*chloris*, 225.  
*creona*, 225.  
*lordaca*, 491.  
*mesentina*, 511.]  
*phisadia*, 488.  
*vallei*, 317.  
*virginia*, 315, 317.  
*zeuxippe*, 511.

- Piezorhynchus castus*, 432.  
*Pionus corallinus*, 309.  
*seniloides*, 309.  
*Pipreola jucunda*, 298.  
*Pipridea melanonota venezuelensis*, 289.  
*Pithecopus elorea*, 224.  
*Pitta brachyura*, 579.  
*vigorsi*, 579.  
*Pituophis mexicanus*, 475.  
*Placostylus morosus*, 270.  
*rambiensis*, 270.  
*seemanni*, 270.  
*Plagiostila asturiana*, 127.  
*Planorbis trivolvus*, 129.  
*Platydia anomoioides*, 142.  
*Platyeris biguttata*, 461.  
*Plusia extrahens*, 519.  
*limbirena*, 497.  
*verticillata*, 519.  
*Plusiodonta* sp. ?, 323.  
*Podophthalmus vigil*, 10.  
*Poecilothraupis atricrissa*, 289.  
*lunulata*, 289.  
*Poecilotriccus ruficeps*, 295.  
*rufigenis*, 295.  
*Polyboroides typicus*, 251.  
*Polygonus lividus*, 319.  
*Polyommatus amarah*, 483.  
*batious*, 483, 505.  
*karsandra*, 506.  
*Pontia acaste*, 490.  
*alceste*, 225.  
*arne*, 488.  
*dynamene*, 487, 509.  
*glauconome*, 492.  
*pleione*, 488.  
*protomedia*, 490.  
*Porphyrio melanopterus*, 426.  
*Porzana carolina*, 313.  
*Praonetha pleuricausta*, 219.  
*Pratincola axillaris*, 556, 557.  
*maura*, 557.  
*sybilla*, 557.  
*Precis sophia*, 222.  
*terea*, 222.  
*Prodenia caradrinoides*, 495.  
*commelinea*, 322.  
*ingloria*, 495.  
*Propilidium pertenne*, 148.  
*Proteides angasi*, 318, 320.  
*idas*, 318.  
*Protoparce cingulata*, 321.  
*convolvuli*, 494.  
*rustica*, 321.  
*Psammobia ferroensis*, 145.  
*Psammomys obesus*, 89.  
*Pseudocolaptes boissonneaui*, 290.  
*Psittospiza riefferi*, 282, 292.  
*Pterophorus congrualis*, 526.  
*Pterygospidea dyalata*, 493.  
*Ptilopus flavovirescens*, 430, 433, 577, 580.  
*wallacii*, 433.  
*xanthogaster*, 430, 433, 580.  
*Ptychozoon homalocephalum*, 476.  
*Puffinus griseus*, 150.  
*Puncturella profunda*, 148.  
*Pygospila tyres*, 524.  
*Pyrallis gerontesalis*, 523.  
*uberatis*, 523, 529.  
*Pyrameis cardui*, 482, 505.  
*spiroletus*, 352.  
*Pyramidella leviuscula*, 364.  
*mediterranea*, 363.  
*minuscula*, 363.  
*nitidula*, 363, 372.  
*Pyramidella plicosa*, 364.  
*Pyrgus evanidus*, 512.  
*—*, var. *adenensis*, 493.  
*galba*, 512.  
*purendra*, 512.  
*syrichtus*, 319.  
*vindex*, 227.  
*Pyrglena picea*, 302.  
*Pythia albivaricosa*, 267.  
*apiensis*, 268, 281.  
*castanea*, 261.  
*ceylonica*, 269.  
*ovatus*, 268.  
*pantherina*, 261.  
*pollex*, 267.  
*regularis*, 268.  
*savaiensis*, 268.  
*scarabæus*, 261, 267, 268, 269.  
*tortuosa*, 268.  
*verreauxi*, 268.  
*wallacei*, 261.  
*Querquedula capensis*, 173, 174.  
*erythroryncha*, 175.  
*larvata*, 174.  
*Quisqualis indica*, 520, 521.  
*Rallus virginiensis*, 313.  
*Ramphocelus icteronotus*, 282, 290.  
*Ramphomicron microrhynchum*, 305.  
*Rana acutirostris*, 425.  
*agilis*, 422, 425.  
*bufoniformis*, 210.  
*esculenta*, 422, 425, 573, 574, 575, 576.  
*— lessonæ*, 422, 573, 574, 576.  
*grunniensis*, 211.  
*guppyi*, 211.  
*immaculata*, 425.  
*kuhlî*, 210.  
*latastii*, 422, 425.  
*lessonæ*, 425.  
*maculata*, 425.  
*mula*, 422, 425.  
*nigrovittata*, 425.  
*obtusirostris*, 425.

**Rana**

- opisthodon*, 211.  
*punctata*, 425.

**Regalecus**

- argenteus*, 207.  
*Regillus*, n. g., 203.  
*asper*, 204, 205.

**Remigia**

- archesia*, 521.  
*arefacta*, 521.  
*conveniensi*, 499.  
*disseverans*, 324.  
*frugalis*, 499, 521.  
*hansalii*, 521.  
*multilinea*, 521.  
*pellita*, 220.  
*persubtilis*, 324.  
*remanens*, 324.

**Rhacophorus**

- maculatus*, 211.

**Rheithrodon**

- chinchilloides*, 458.  
*pictus*, 448, 450, 457, 458.

**Rhinoceros**

- lasiotis*, 55.

**Rhipidura**

- brachyrhyncha*, 580.  
*fallax*, 580.  
*flabellifera*, 530.  
*fuliginosa*, 530.  
*fusco-rufa*, 432.  
*hamadryas*, 432.  
*lenzi*, 431.  
*opistherythra*, 432.

**Rhodaria**

- sp. ? 325.  
*phænicealis*, 325.

**Rhynchaspis**

- capensis*, 173.

**Rhynchonella**

- sicula*, 142.

**Rissoa**

- abyssicola*, 115, 116.  
*æmula*, 127.  
*affinis*, 124, 149.  
*albella*, 119, 121.  
*algeriana*, 122.  
*angulata*, 119, 149.  
*arctica*, 123.  
*arenaria*, 124.  
*aspera*, 122.  
*asturiana*, 127.  
*calathus*, 111, 113.  
*canaliculata*, 116.  
*canariensis*, 114.  
*cancellata*, 111.  
*curinata*, 116.  
*cinez*, 111.  
*cimicoides*, 112.

**Rissoa**

- cingillus*, 127.  
*concinna*, 127.  
*coriacea*, 125.  
*coronata*, 134, 140.  
*costata*, 116, 117, 118.  
*costulata*, 117, 118, 123.  
*crenulata*, 111.  
*crispa*, 116.  
*deliciosa*, 115, 121, 149.  
*depicta*, 127.  
*desmaresti*, 117.  
*dictyophora*, 113.  
*dolium*, 120, 351.  
*ehrenbergi*, 119.  
*elegantissima*, 115.  
*elongata*, 349.  
*etneensis*, 113.  
*exarata*, 124, 352.  
*exigua*, 116.  
*eximio*, 352.  
*fischeri*, 113, 149.  
*galvagni*, 127.  
*glabra*, 348.  
*gracilis*, 353.  
*granulum*, 121, 127.  
*inconspicua*, 120, 121.  
*intermedia*, 112.  
*interrupta*, 118, 119.  
*jeffreysi*, 112.  
*lactea*, 127.  
*lancea*, 114.  
*lilacina*, 118.  
*maculata*, 127.  
*marie*, 112.  
*membranacea*, 117, 118.  
*mighelsi*, 124.  
*minutissima*, 124.  
*montacuti*, 117, 122.  
*monodonta*, 116.  
*multicostata*, 121.  
*multilineata*, 124.  
*nana*, 120, 121.  
*oblonga*, 118.  
*obtusa*, 126.  
*ænonensis*, 119.  
*ovatella*, 118.  
*parva*, 118, 119.  
*parvula*, 114, 149.  
*philippiana*, 114.  
*picta*, 127.  
*polita*, 347.  
*porifera*, 118.  
*proxima*, 125.  
*pulchra*, 120.  
*punctura*, 114.  
*pusilla*, 120.  
*radiata*, 121.  
*reticulata*, 111, 112.

**Rissoa**

- rudis*, 121.  
*rufilabrum*, 118.  
*sarsii*, 119, 121.  
*saxatilis*, 123.  
*sorobiculata*, 113.  
*sculpta*, 112.  
*semistriata*, 126.  
*similis*, 117, 118.  
*sinuosa*, 367.  
*soluta*, 126.  
*sororcula*, 112.  
*splendida*, 117.  
*stefanisi*, 123.  
*striata*, 123, 124.  
*striatula*, 125.  
*subperforata*, 122.  
*subsolata*, 115, 149.  
*substriata*, 126.  
*sutura*, 353.  
*targionii*, 119.  
*tenuicostata*, 113.  
*tenuiplicata*, 127.  
*tenuisculpta*, 125.  
*testa*, 115, 116, 149.  
*textilis*, 112.  
*trinodosa*, 352.  
*turgida*, 126.  
*turricola*, 120, 149.  
*variabilis*, 116, 117, 118, 123.  
*variegata*, 121.  
*venus*, 111.  
*violacea*, 116, 118.  
*vitrea*, 125.  
*wyville-thomsoni*, 122, 123.  
*zetlandica*, 113, 116.
- Rivula**  
*flavonigra*, 522, 529.  
*sericealis*, 522.
- Romaleosoma**  
*agnes*, 223.  
*medon*, 223.
- Rusticus**  
*adolescens hanno*, 316.
- Salamandra**  
*atra*, 422, 423.  
*maculosa*, 422, 423.
- Salamandrina**  
*perspicillata*, 422, 423.
- Salatura**  
*genutia*, 504.
- Salmo**  
*alpinus*, 37, 593.  
—, var. *struanensis*, 379.  
*argenteus*, 34.  
*brachypoma*, 34.  
*cambricus*, 34.  
*coreganoides*, 28.

**Salmo**

- fario*, 29, 33, 35, 588.  
 —, var. *ausonii*, 35.  
 —, var. *gaimardi*, 35.  
 —, var. *levenensis*, 588.  
*ferox*, 33, 34, 35, 589.  
*fontinalis*, 23, 27, 30,  
 31, 33, 37, 38, 377,  
 378, 379, 585, 588,  
 593.  
*fluviatilis*, 28.  
*gallinensis*, 35.  
*gracilis*, 17, 25.  
*levenensis*, 18, 23, 33,  
 35, 37, 377, 593.  
*nigripinnis*, 35.  
*orcadensis*, 34.  
*salar*, 18, 20, 23, 25,  
 26, 34, 35, 37, 376,  
 377, 378, 582, 584,  
 588.  
*stomachicus*, 35.  
*struanensis*, 586.  
*trutta*, 34.

**Salpornis**

- emini*, 415, 416, 417.  
*salvadoria*, 416, 417.  
*spilonota*, 416, 417.

**Samea**

- sp. ? , 325.  
*ecclesiastis*, 325.

**Sarangesa**

- purendra*, 512.

**Sauropatis**

- chloris*, 432.  
*sancta*, 426, 432.

**Scalaria**

- acus*, 139, 149.  
*algeriana*, 134, 140,  
 149.  
*cantrainei*, 133.  
*celesti*, 136.  
*clathratula*, 136.  
*clathrus*, 137.  
*coartata*, 139.  
*communis*, 137.  
*coronata*, 134, 141.  
*corrugata*, 132.  
*crassilabrum*, 141.  
*crenata*, 141.  
*crispa*, 136.  
*disjuncta*, 135.  
*eximia*, 136.  
*foliacea*, 136.  
*formosissima*, 140, 149.  
*frondicula*, 137.  
*frondosa*, 134, 136, 137.  
*geniculata*, 133.  
*grœnlandica*, 136, 137.  
*hellenica*, 134, 140.  
*kuzmici*, 134.

**Scalaria**

- lanceolata*, 133.  
*longissima*, 132, 149.  
*multilineata*, 134.  
*muricata*, 134, 136.  
*nana*, 134, 135, 149.  
*obtusicaudata*, 139.  
*peocchioliana*, 136.  
*producta*, 136.  
*pseudopulchella*, 137.  
*pulchella*, 134, 136.  
*pumicea*, 140.  
*pumila*, 136.  
*rugosa*, 136.  
*scuacchii*, 141.  
*schantzii*, 134.  
*semidisjuncta*, 135,  
 149.  
*serrata*, 140.  
*soluta*, 136.  
*spinosa*, 136.  
*striatissima*, 140.  
*subdecussata*, 132.  
*subulata*, 138.  
*tenera*, 139, 149.  
*tenuicaudata*, 138.  
*torulosa*, 133.  
*trevelyana*, 134, 137.  
*turbona*, 134, 138.  
*uncinaticosta*, 134.  
*varicosa*, 139, 140.  
*vittata*, 133, 149.

**Scarites**

- striatidens*, 404.

**Schistes**

- personatus*, 305.

**Schizophrys**

- seratus*, 10.

**Seirpophaga**

- degenerella*, 528.

**Scissurella**

- umbilicata*, 148.

**Scoparia**

- vinetalis*, 502.

**Scopula**

- massalis*, 525.  
*palmaris*, 525, 529.  
*subjectalis*, 501.  
*vinetalis*, 502.

**Scopus**

- umbretta*, 543, 553.

**Seotomera**

- tristis*, 526.

**Serobicularia**

- alba*, 145.  
*longicallus*, 145.

**Scytalopus**

- magellanicus*, 282,  
 303.

**Selepa**

- docilis*, 520.

**Sephela**

- linearis*, 459.

**Serolis**

- acutangula*, 330.  
*antarctica*, 330, 333,  
 338, 339, 340.  
*australensis*, 330, 334,  
 335.  
*bromleyana*, 330, 331,  
 332, 338, 339.  
*carinata*, 330, 337.  
*convexa*, 330, 338.  
*cornuta*, 330, 338, 340.  
*elongata*, 330, 335.  
*gaudichaudii*, 330, 333.  
*gracilis*, 330, 332, 338,  
 340.  
*latifrons*, 330, 338, 340.  
*longicaudata*, 330, 335,  
 336.  
*minuta*, 330, 334, 337.  
*neera*, 330, 331, 338,  
 339, 340.  
*orbigniana*, 330.  
*ovalis*, 330.  
*pallida*, 330, 335.  
*paradoxa*, 330, 337,  
 338, 340.  
*plana*, 330, 338.  
*schythei*, 330, 332, 338,  
 340.  
*septemcarinata*, 330,  
 338.  
*serrei*, 330, 338.  
*trilobitoides*, 330, 338.  
*tuberculata*, 330, 334.  
**Serpophaga**  
*leucura*, 295.  
**Serpula**  
*anguina*, 130.  
**Setophaga**  
*bairdi*, 286.  
*verticalis*, 287.  
**Siagona**  
*fusipes*, 404.  
*mandibularis*, 404.  
**Sicydium**, 153.  
 sp. n. ? , 164.  
*acutipinne*, 154, 159.  
*alboteniatum*, 155, 164.  
*antillarum*, 154, 157,  
 172.  
*brevifile*, 154, 158, 172.  
*cynocephalum*, 156,  
 166.  
*elegans*, 155, 162.  
*fasciatum*, 156, 168.  
*griseum*, 156, 169.  
*gymnauchen*, 155.  
*gymnogaster*, 153, 154,  
 158, 172.

- Sicydium*  
*lagocephalum*, 155, 161, 166.  
*laticeps*, 154, 160.  
*macrostetholepis*, 156, 161.  
*microcephalum*, 156, 169.  
*micurum*, 155, 164.  
*nigrescens*, 155, 165, 166.  
*parvei*, 156, 166, 167.  
*parvipinne*, 156, 170.  
*plumieri*, 153, 154, 156, 172.  
*pugnans*, 153, 155, 160, 172.  
*salvini*, 154, 195, 172.  
*stimpsoni*, 155, 166, 172.  
*teniurum*, 153, 155, 161, 172.  
*xanthurum*, 155, 162.  
*Sicyogaster*  
*concolor*, 171, 172.  
*Sicyopterus*, 153.  
*cynocephalus*, 166.  
*macrostetholepis*, 168.  
*microcephalus*, 169.  
*micurus*, 164.  
*parvei*, 167.  
*stimpsoni*, 166.  
*(Sicydiops) xanthurus*, 162.  
*Siliquaria*  
*anguina*, 130.  
*Siphodentalium*  
*affine*, 147.  
*quinquangulare*, 147.  
*Sitta*  
*canadensis*, 233, 414.  
*krueperi*, 233, 414.  
*villosa*, 414.  
*whiteheadi*, 233, 329, 414, 415.  
*Solenocera*  
*lucasi*, 10, 15.  
*Spælotis*  
*undulans*, 516.  
*Spelerpes*  
*fuscus*, 422.  
*Spermophila*  
*gutturalis olivacea*, 293.  
*luctuosa*, 293.  
*obscura*, 293.  
*pauper*, 293.  
*Sphærocoris*  
*ocellatus*, 459.  
*Sphenophorus*  
*obscurus*, 217.  
*Sphingomorpha*  
*monteironis*, 498.  
*Sphingurus*  
*spinus*, 389.  
*villosus*, 389.  
*Sphinx*  
*celeris*, 494.  
*idrius*, 494.  
*livornica*, 494.  
*nerii*, 494.  
*Spilodes*  
*nitetisalis*, 501.  
*Spodoptera*  
*capicola*, 228.  
*Squilla*  
*bradyi*, 16.  
*schmeltzii*, 16.  
*Steganocerus*  
*multipunctatus*, 459.  
*Steganura*  
*melananthera*, 305.  
*Stenogyra*  
*(Nothus) bulimoides*, 280.  
*(—) splendidula*, 280, 277.  
*(Subulina) aciona*, 277.  
*Stenopteryx*  
*hybridalis*, 525.  
*Stereoderma*  
*murrayi*, 255.  
*unisemita*, 255.  
*Sterra*  
*saccharia*, 528.  
*Stigmatops*  
*salvadorii*, 577.  
*squamata*, 432, 577.  
*Stilbe*  
*acuta*, 130, 149.  
*Strepsiceros*  
*imberbis*, 45, 46, 47, 48, 539, 542.  
*kudu*, 46, 47, 48, 542.  
*tendal*, 48.  
*Strix*  
*sororcula*, 431.  
*streptans*, 559.  
*Succinea*  
*bermudensis*, 277.  
*falklandica*, 280, 281.  
*fragilis*, 280.  
*humerosa*, 272.  
*oblonga*, 280.  
*papillata*, 272.  
*(Omalonyx) gayana*, 281.  
*(Truella) infundibuliformis*, 272.  
*Sycalis*  
*luteola*, 294.  
*Sycobrotus*  
*reichensowi*, 557.  
*Sylvia*  
*habessinica*, 231.  
*nisoria*, 477.  
*Symphyletes*  
*pedicornis*, 219.  
*Synallaxis*  
*erythrops*, 298.  
*frontalis*, 298.  
*fruticicola*, 298.  
*pubica*, 298.  
*wyatti*, 299.  
*Synchlœ*  
*glauconome*, 492.  
*iranica*, 492.  
*Synclera*  
*tradicionalis*, 501.  
*univocalis*, 501.  
*Syngamia*  
*florellalis*, 325.  
*Syntomedia*  
*angasi*, 320, 321.  
*sauleyi*, 322.  
*Syrnola*  
*minuta*, 351.  
*nitidula*, 363.  
*Tachyglossus*  
*aculeatus*, 150, 151, 152.  
*hystrix*, 150.  
*lawesi*, 150, 151, 152.  
*Tachyris*  
*chloris*, 225.  
*saba*, 226.  
*Tadorna*  
*radjah*, 434.  
*Tanagra*  
*auricrissa*, 290.  
*cana*, 290.  
*cynocephala*, 290.  
*darwinii*, 283, 290.  
*Tanygnathus*  
*subaffinis*, 431.  
*Taphozous*  
*affinis*, 52, 53.  
*—, var. insignis*, 51, 52, 53.  
*australis*, 52.  
*saccolæmus*, 52, 53.  
*Taragama*  
*ganesa*, 515.  
*Tarucus*  
*nara*, 484, 506.  
*plinius*, 506.  
*pulcher*, 483.  
*theophrastus*, 484, 506.  
*Telegonus*  
*anaphus*, 319.

**Tellina**

*balaustrina*, 145.

*compressa*, 145.

*serrata*, 145.

**Temnorhynchus**

*orbicatus*, 405.

**Tephрина**

*arenacearia*, 527.

*arenaria*, 527, 529.

*lithina*, 527.

*peremptaria*, 527.

*strenuataria*, 527.

*sublimbata*, 502.

**Teracolus**

*acaste*, 489, 490.

*amatus*, 435, 440.

*arne*, 439.

*bimburia*, 511.

*calaia*, 487.

*caruifer*, 487, 488, 509.

*chrysomela*, 488.

*calestis*, 435, 445, 489,

490.

*daiva*, 441.

*danae*, 434, 435, 443,

444, 510.

*diurus*, 509.

*dubius*, 439, 509.

*dulcis*, 509, 510.

*dynamene*, 487, 488, 509.

*eboreoides*, 509, 510.

*epigone*, 490.

*etrida*, 510.

*eucharis*, 510.

*evippe*, 229.

*farrinus*, 511.

*faustina*, 436, 437.

*faustus*, 434, 435, 436,

437, 508.

*fulvia*, 437.

*fumidus*, 442, 445.

*galanthus*, 440.

*glyocera*, 441.

*halimede*, 435, 436, 445,

490.

*hewitsoni*, 490.

*immaculatus*, 443, 510.

*intermissus*, 438, 439,

509.

*interruptus*, 435, 440.

*kennedii*, 440.

*leo*, 436, 445.

*liagore*, 435, 441.

*limbatus*, 511.

*miles*, 490.

*miriam*, 436, 488, 489,

490.

*modestus*, 440.

*nouna*, 491.

*ochreipennis*, 438, 509.

*odysseus*, 441, 445.

**Teracolus**

*oriens*, 436, 437.

*pelus*, 439, 445, 509.

*pernotatus*, 511.

*phisadia*, 434, 439, 488,

492.

*phantus*, 443, 509, 510.

*pleione*, 436, 488, 489.

*protomedia*, 490.

*protractus*, 508.

*puellaris*, 438, 439, 509.

*purus*, 510.

*rorus*, 438, 439, 445.

*sanguinalis*, 444.

*saxeus*, 441, 445, 491.

*sipylus*, 444, 445.

*solaris*, 437, 445.

*subroseus*, 443, 445, 510.

*subvenosus*, 445.

*swinhoei*, 491.

*taplini*, 444, 445.

*tripunctata*, 437.

*vestalis*, 434, 435, 438,

439, 509.

*vi*, 437, 445, 488.

*xanthus*, 440, 445.

*yerburii*, 441, 445, 491.

**Terebratula**

*caput-serpentis*, 142.

*septata*, 142.

*tuberala*, 142.

*vitrea*, var. *minor*, 142.

**Terias**

sp. ?, 225.

*asiopo*, 485, 508.

*asphodelus*, 508.

*brigitta*, 225.

*chalconiata*, 485.

*curiosus*, 508, 529.

*desjardinsii*, 225.

*deva*, 317.

*floricola*, 225.

*hecabe*, 507, 508.

*hecabeoides*, 508.

*lata*, 507.

*pulchella*, 225.

*purreea*, 508.

*rahal*, 225.

*senegalensis*, 225.

*venata*, 508.

**Testudo**

*elephantopus*, 206.

**Tetraceros**

*quadricornis*, 2, 3, 4, 5.

**Tetrao**

*griseiventris*, 409.

*mlokoziwiczii*, 409.

**Tetratocera**

*ericata*, 324.

**Thalamita**

*crenata*, 10.

**Thalera**

*diatomata*, 526.

**Thalurania**

*hypochlora*, 282.

**Thamnophilus**

*albinuchalis*, 282.

*transandeanus*, 282.

*unicolor*, 301.

**Thanaos**

*djalala*, 498.

**Tharsis**

*romettensis*, 148.

**Thecla**

*salona*, 317.

**Thermesia**

sp. ?, 229.

*fusilinea*, 324.

*gemmatalis*, 324.

**Thiacides**

*postica*, 515.

**Thomisus**

*decipiens*, 196, 197,

199.

*dissimilis*, 197.

*tuberosus*, 197, 200.

**Thryothorus**

*euphrya*, 235.

*mystacalis*, 235.

**Thylacinus**

*cynocephalus*, 561.

**Thymelo**

*proteus*, 318.

*santiago*, 318.

**Thyone**

*jusus*, 373.

*okeni*, 254.

**Thyridospila**

*suffusa*, 324.

**Tinea**

*pulchella*, 495.

*swinhoei*, 502.

*tapetzella*, 502.

**Tinnunculus**

*moluccensis*, 431.

**Tirumela**

*limniace*, 503.

**Tmesisternus**

*glaucus*, 218.

**Todirostrum**

*rufigene*, 295.

**Tornatellina**

*bilamellata*, 280.

*trochiformis*, 280.

**Totanus**

*incanus*, 433.

**Toxicum**

*gazella*, 216.

*quadricornis*, 216.

**Toxocampa**

sp. ?, 229.

*salax*, 229.

- Trachyphonus**  
*purpuratus*, 470.  
**Trapezia**  
*areolata*, 11.  
*ferruginea*, 10.  
*flavopunctata*, 10, 11, 12.  
*latifrons*, 12.  
**Triboniophorus**  
*graeffii*, 272, 273.  
*krafftii*, 273, 274.  
*schultzei*, 273.  
**Trigonocephalus**  
*blomhoffi*, 475.  
**Trigonodes**  
*acutata*, 498.  
*anfractuosa*, 490.  
*hippasia*, 521.  
**Triton**  
*alpestris*, 422, 423.  
*oristatus*, 423.  
—, subsp. *karelinii*, 422, 423.  
—, subsp. *longipes*, 422, 423.  
*vulgaris*, 423.  
—, subsp. *meridionalis*, 422, 423.  
**Trochilus**  
*pilula*, 404.  
**Trochus**  
*exasperatus*, 148.  
*leucophæus*, 148.  
*miliaris*, 149.  
*ottoi*, 148.  
*suturalis*, 148.  
*wisleri*, 148.  
*zayphinus*, 149.  
**Troglodytes**  
*audax*, 285.  
*furvus*, 285.  
*solstitialis*, 285.  
**Trogon**  
*heliothris*, 307.  
*personatus*, 307.  
*propinguus*, 307.  
*virginalis*, 307.  
**Tropidonotus**  
*cyclopion*, 475.  
**Truncatella**  
*julia*, 354.  
**Trutta**  
*reticulata*, 27.  
**Turbo**  
*acinus*, 111.  
*acutus*, 357.  
*albus*, 121, 357.  
*ambiguus*, 138.  
*ascaris*, 342.  
*cancellatus*, 111.  
*cimes*, 111.  
**Turbo**  
*cingillus*, 127.  
*clathratulus*, 136.  
*clathrus*, 137.  
— *granlandicus*, 137.  
*concoideus*, 347.  
*corrugatus*, 132.  
*costatus*, 116.  
*oreatus*, 141.  
*curvatus*, 367.  
*deousatus*, 352.  
*elegantissimus*, 357.  
*gemoulatus*, 135.  
*gracilis*, 359.  
*indistinctus*, 354.  
*insculptus*, 349.  
*interruptus*, 118.  
*interstinctus*, 353.  
*lacteus*, 357.  
*membranaceus*, 117.  
*minutus*, 128.  
*pallidus*, 348.  
*parvus*, 118.  
*plicatulus*, 357.  
*plicatus*, 349.  
*politus*, 366.  
*pumiceus*, 140.  
*punctura*, 114, 115.  
*quadricarinatus*, 364.  
*reticulata*, 112.  
*ruder*, 129.  
*semistriatus*, 126.  
*spiralis*, 352.  
*striatulus*, 125, 350.  
*striatus*, 123.  
*subulatus*, 365.  
*terebra*, 131.  
*tricarinatus*, 131.  
*triplicatus*, 131.  
*turtonis*, 138.  
*ulva*, 128.  
*ungulinus*, 131.  
*unicus*, 341.  
*unidentatus*, 346.  
*variabilis*, 117.  
*vitreus*, 125.  
*setlandicus*, 116.  
**Turbonella**  
*transparens*, 348.  
**Turbonilla**  
*acuticoostata*, 359, 372.  
*albella*, 348.  
*bushiana*, 357.  
*clavula*, 345.  
*eximia*, 352.  
*gradata*, 358.  
*humboldtii*, 352.  
*magnifica*, 357.  
*meneghini*, 357.  
*obliqua*, 349.  
*plicatula*, 357.  
**Turbonilla**  
*rathbuni*, 356.  
*speciosa*, 357.  
**Turdus**  
*ignobilis maculirostris*, 283.  
*serranus*, 283.  
**Turritella**  
*communis*, 131.  
*geinitzi*, 131.  
*incrassata*, 131.  
*interrupta*, 356.  
*philippi*, 132.  
*potamoides*, 356, 357.  
*suturalis*, 131, 132.  
*terebra*, 131, 364.  
*tricarinata*, 131.  
*triplicata*, 131.  
**Tyranniscus**  
*chrysope*, 296.  
*uropygialis*, 290.  
**Tyrannus**  
*melancholicus*, 298.  
**Urapteryx**  
*politia*, 324.  
**Urosplax**  
*albiventris*, 431.  
**Urosplax**  
*sp.*, 577.  
*albiventris*, 426, 577.  
**Venus**  
*casina*, 145.  
*effusa*, 145.  
*multilamella*, 145.  
*rudis*, 145.  
**Vireosylva**  
*josepha*, 287.  
**Vitina**  
*inflata*, 272.  
*lamarckii*, 276.  
*leucospira*, 272.  
*masteri*, 272.  
*strangei*, 272.  
*verreauxi*, 272.  
*virens*, 272.  
**Volatinia**  
*jacarina splendens*, 294.  
**Xanthodes**  
*arcuata*, 517.  
*innocens*, 496, 517.  
**Xanthoptera**  
*semilutea*, 499.  
**Xema**  
*sabinii*, 150.  
**Xenophthalmodes**  
*mabii*, 10, 12.

*Xenorhynchus*  
*senegalensis*, 551.  
*Xylophasia*  
*denterna*, 322.  
*lignicolora*, 495.  
*opposita*, 495.  
*rurea*, 495.

*Yplithina*  
*asterope*, 481.  
*itionia*, 220.

*Zebronia*  
*aurolinealis*, 524.  
*semizebralis*, 325.  
*Zenaida*  
*maculata*, 311.  
*Zethes*  
*umbrata*, 323.  
*Zizera*  
*gaika*, 484.  
*karsandra*, 506, 507.  
*knysna*, 484.  
*mora*, 506, 529.

*Zizera*  
*pygmaea*, 484, 507.  
*trochilus*, 484.  
*Zonites*  
*cellaria*, 276.  
*Zonotrichia*  
*pileata*, 204.  
*Zosterops*  
*griseiventris*, 432.  
*Zozymus*  
*pubescens*, 10.

THE END.